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THE CLINICAL AND PATHOLOGICAL DIFFERENTIAL DIAGNOSIS OF DISEASES OF THE FEMALE BREAST.

By Joseph C. Bloodgood, M.D.,

ASSOCIATE PROFESSOR OF SURGERY, JOHNS HOPKINS UNIVERSITY, BALTIMORE, MARYLAND.

In view of the comparative rarity of similar affections in the breast of the male I shall confine my remarks to diseases of the breast of the female. Malignant tumors, chiefly carcinoma, are by far the most frequent disease. It should be the object of the clinician to bear this in mind and to look upon every palpable mass in the breast of a woman as malignant until positive proof of its benignity is established. Up to twenty-five years of age malignant tumors are so infrequent that for practical purposes they need not be considered. Between puberty and twenty-five years of age lesions of the breast are benign.

Intracanalicular Myxoma. The most common tumor is the intracanalicular myxoma, or the so-called periductal fibromyxoma. This fibro-epithelial tumor is often multiple in one or both breasts. The single tumor is encapsulated, lobulated, and has a characteristic elasticity. It can be recognized at the exploratory incision by its definite capsule and, on section, by its myxomatous lobules, which are roundish and project above the cut surface. When these tumors are multiple in one or both breasts, small, give no pain, and exhibit no growth, operation is not indicated. They may remain quiescent for years and may ultimately disappear. Operation is indicated when one of these tumors gives much pain or exhibits growth. It is then only necessary to remove the tumor. This can be done with a small scar and without interference with later lactation. It is interesting to note that breasts the seat of single or multiple intracanalicular myxoma lactate in a normal

manner, and the tumor, in its parenchyma, undergoes lactation hypertrophy with the production of milk, like the normal breast. Billroth first observed this. I have seen it in two instances. The single intracanalicular myxoma, usually in women over twenty-five, may grow rapidly and produce a tumor occupying the entire breast. The largest recorded tumors of the breast have begun as intracanalicular myxoma. As this tumor increases in size cysts may form, and sarcomatous degeneration is likely to take place The huge tumors of the breast illustrated in the older monographs on this subject by Velpeau, Brodie, Billroth, and Gross are of this character, and were called serocystic sarcoma. In view of the tendency of large intracanalicular myxomas to become sarcomatous, every tumor of this character should be treated as a sarcoma. The tumor, an area of skin, the entire breast, and the major pectoral muscle should be removed in one piece. It is not necessary to remove the axillary glands.

Fibro-adenoma. The next most common tumor of the breast between puberty and the age of twenty-five is the fibro-adenoma. This, like the intracanalicular myxoma, is a fibro-epithelial tumor. The fibro-adenoma microscopically is nothing more than an encapsulated area of normal breast tissue in which the parenchyma, in the early stage of the tumor, is greater in amount than in the normal breast. Later, the parenchyma undergoes pressure atrophy, and the tumor may become calcified. In my experience malignant tumors, either carcinoma or sarcoma, seldom arise in the fibro-adenoma. This tumor may be single or multiple, in one or both breasts. It is distinctly encapsulated, firm, and has not the elasticity of the intracanalicular myxoma; at the exploratory incision its distinct capsule distinguishes it from the circumscribed carcinoma. The treatment of the multiple fibro-adenoma is the same as that for the multiple intracanalicular myxoma. Lactation hypertrophy has also been observed in these tumors. This tumor has been noted outside the mammary gland, and might be looked upon as aberrant breast tissue.

Diffuse Virginal Hypertrophy. A rare lesion of the younger female breast is the so-called diffuse virginal hypertrophy. It is a symmetrical enlargement of both breasts. The clinical picture is so distinct that it cannot be mistaken. Until recently carcinoma had never been recorded in this hypertrophy, but during the last two years I have observed carcinoma of the breast in two women, both over twenty-five years of age, in whom the breasts were the seat of this hypertrophy to a moderate degree. Unilateral hypertrophy occurs in the male, but all cases in the female, studied pathologically, have been fibro-epithelial.

Every single tumor of the breast in a woman over twenty-five years of age should be explored without delay. These tumors may be divided clinically into two great groups—doubtful and malignant.

MALIGNANT TUMORS. For the malignant tumor one proceeds, without an exploratory incision, to perform the complete operation for carcinoma. This extensive dissection was first advocated by Halsted. It consists of excision of the breast with a wide area of skin, a wider area of subcutaneous fat and fascia, both pectoral muscles, and the axilla, in one piece. This wound is closed, except for a gap which is immediately covered with skin grafts. The mortality of this operation in Halsted's clinic is less than 1 per cent.

During the dissection of the axilla and after the completion of the operation the condition of the axillary glands is carefully investigated by the surgeon. If he can demonstrate no evidence of metastasis, or only the involvement of the lower or basal axillary glands, the operation is considered complete. However, if metastatic glands are found higher than the basal glands, the surgeon should remove a triangular mass of tissue in the supraclavicular fossa, bounded below by the clavicle and the subclavian vein, and on the medial side by the internal jugular vein. The dissection should be carried along the vein above the level of the omohyoid muscle, and along the clavicle to a little beyond the junction of the middle and the outer third. No matter how early one operates for a malignant tumor of the breast, the operation should never be restricted.

The statistics in Halsted's clinic up to the present time show that among 210 cases, in which three years or more have passed since the operation, 42 per cent. are apparently well. If we consider the cases in which the axillary glands, studied microscopically, showed no evidence of metastasis, 61 cases, or 85 per cent., are well. In cases in which the axillary glands showed metastasis (110), 30 per cent. remained free from recurrence for three years. When the glands in the neck showed metastasis (40 cases), only 10 per cent. remained well for three years. In all of these groups metastasis has been observed after an interval of three years of apparent cure. Such late metastasis may take place up to eight years after operation. Excluding these cases of late recurrence, the definitely cured in these three groups is reduced to 75, 24, and 7 per cent. respectively, or for all cases together, 35 per cent. I have not time to give the facts, but there is evidence to indicate that when the microscope fails to demonstrate metastatic cancer cells in the lymphatic glands in the axilla, this is not a positive proof that metastasis has not taken place, and for this reason and others, which space prevents me from stating, there should be no restriction in the complete operation for carcinoma of the breast.

When one cannot make a diagnosis of malignancy in a tumor of the breast, of course it is not justifiable to perform the complete operation. It is quite true that in a woman over twenty-five the probabilities are in favor of carcinoma, but there are a number of benign lesions which may appear in the breast of a woman at any age past twenty-five years, and in which conservative measures may be em-

ployed. In such cases one explores the tumor with the knife, cutting through the skin and subcutaneous fat directly over the tumor. In the majority of malignant tumors the nature of the disease can be recognized, before the tumor is reached, by the infiltration. Time forbids a detailed discussion of how the various lesions of the breast can be recognized at the exploratory incision, but the fact remains that this can be done, and it is the only method which allows an immediate decision as to the nature of the tumor. If the explored tumor prove to be malignant, one cauterizes the wound with pure carbolic acid or the Paquelin cautery and proceeds at once with the complete operation for carcinoma. My personal study of cases of carcinoma of the breast in which a clinical diagnosis could not be made, and in which exploratory incision was performed and followed at once by the complete operation, has shown that there is no evidence that cancer has been disseminated by this procedure.

When the tumor explored is not malignant the extent of the operation is governed by two factors—the nature of the tumor and the condition of the surrounding breast. The procedures are: Excision of the tumor only; excision of the entire breast; and excision of both breasts. The indications for these will be discussed later.

The clinical signs of a malignant tumor are based upon the palpation of the tumor, and the changes in the skin, subcutaneous fat, and the nipple. To diagnosticate a malignant tumor from palpation only requires great experience. The diagnosis of malignancy can be made positively by the demonstration of retraction of the nipple, any dimpling, fixation of the skin, or atrophy of the subcutaneous fat. Measurements of the various diameters of the breast with the nipple as the centre have proved to be of great aid. Shortening of the diameter in the quadrant in which the palpable tumor is situated is almost pathognomonic of cancer; increase in this diameter may be due to a benign lesion.

The symptoms of onset in tumors of the breast are: Tumor, pain, retraction of the nipple, dimpling of the skin, discharge from the nipple, and palpable axillary glands. In the majority of cases tumor is the symptom of onset. In a few, pain may precede the appearance of the tumor days, weeks, or months. Persistent localized pain in the breast shoud make one suspicious of a tumor formation. I have never explored the breast for pain only. Pain is not a symptom of malignant tumor only; in fact, it is more common in benign lesions as an early symptom or the symptom of onset, especially in cysts, senile parenchymatous hypertrophy, and fibro-adenoma. It is a late symptom in cancer. Retraction of the nipple may be looked upon as pathognomonic of cancer. It is rarely the first symptom. I have observed it but once without a palpable tumor, and in this case the exploratory incision revealed a small infiltrating scirrhus. Dimpling of the skin in a few instances has been first observed by the patient. In all of my observations a tumor was to be felt. A discharge from

the nipple, except during lactation, may be looked upon as a sign of a benign lesion and not a symptom of cancer. If the discharge is blood or a cloudy serum, this is a positive sign of a cyst with an intracystic papillomatous growth. In these cases such a discharge is frequently observed by the patient for months or years. In senile parenchymatous hypertrophy one can express sometimes from the nipple a thick, brownish material—the accumulation of degenerated, desquamated epithelium in the dilated ducts. The patient seldom observes this. In a few cases the patients observed palpable glands in the axilla before they felt the tumor. Until recently I had never observed large palpable glands in the axilla without finding the tumor in the breast; but lately I have seen such a case. I do not look upon palpable glands as any aid in the differential diagnosis of tumor of the breast. If the glands are large or hard enough to be of themselves diagnostic of cancer, the tumor is also clearly malignant clinically. Palpable glands of a non-malignant nature are so frequent in the axilla that their presence or absence cannot be utilized as evidence for or against the malignant nature of the palpable tumor in the breast.

In spite of a large and increasing experience in tumors of the breast, surgeons will find that a clinical diagnosis is not always possible. The earlier patients seek advice after the first symptom the more frequently will this occur. For this reason a surgeon must educate himself to differentiate between the benign and the malignant tumor of the breast at the exploratory incision. Some surgeons prefer, at the exploratory incision, to cut out a piece for immediate frozen section and microscopic study; this can be done in about ten minutes. For the last three years I have had made immediate frozen sections of fresh tissue received in the pathological laboratory, but up to the present time a stained frozen section has never been of aid in making the diagnosis when we have been unable to come to a conclusion from the fresh appearance of the tissue, nor, up to the present time, have I ever depended upon a frozen section to influence the operative procedure; I have always been governed by the decision made from the study of the fresh appearances at the exploratory incision.

THE POSSIBLE TUMORS IN THE BREASTS OF WOMEN OVER TWENTY-FIVE YEARS OF AGE. In view of what has been said, we are interested in all the benign lesions and those forms of carcinoma in which a clinical diagnosis cannot be made. For further details beyond those possible in this short paper, I should like to refer to other papers.[1]

[1] Surgery, Gynecology, and Obstetrics, December, 1906, vol. iii, p. 721, in which I discussed senile parenchymatous hypertrophy of the female breast, and its relation to cyst formation and carcinoma; The Bulletin of the Johns Hopkins Hospital, April, 1907, on benign and malignant cysts of the breast; and the Journal of the American Medical Association, November, 1906, vol. xlvii, p. 1470, on the importance of an early recognition and the operative treatment of malignant tumors.

The tumors of the breast which may appear clinically doubtful can be separated into two great groups—the larger group, the solid tumors, and the relatively smaller group, the cystic.

Solid Tumors of the Breast. The solid benign tumors are: The intracanalicular myxoma, the fibro-adenoma, the cystic adenoma, tuberculosis, non-tubercular mastitis, and senile parenchymatous hypertrophy. Any form of solid cancer or sarcoma may in its early stage be clinically doubtful. All solid tumors of the breast may appear either as distinctly encapsulated, circumscribed nodules, or areas of induration. If a tumor, no matter what its character, is buried in the breast tissue, one does not palpate directly the tumor, but the surrounding breast. For this reason encapsulated tumors may give to the palpating finger a sense of a non-encapsulated mass, due to the feeling of the condensed breast tissue surrounding the tumor. If the tumor has covering it only skin and fat, its nature and consistency are more readily demonstrable. But if the patient has large breasts and thick subcutaneous fat and the tumor is small, it is very difficult to ascertain from palpation the exact nature. Further discussion is not necessary. The facts are that it is frequently impossible to make a positive diagnosis of a tumor of the breast in a woman over twenty-five; so that, at the exploratory incision, any one of the possible tumors mentioned may be exposed.

The *intracanalicular myxoma*, which I have discussed, is most easily recognized. I have observed these tumors to arise up to forty-two years of age. The fibro-adenoma may be confused with a circumscribed scirrhus carcinoma. In the laboratory I have received from outside sources a number of such specimens in which a circumscribed carcinoma has been removed on the diagnosis of a fibro-adenoma, and in a few cases in which the complete operation for carcinoma had been performed the tumor proved to be a fibro-adenoma. A careful study at the exploratory incision should make the diagnosis. The carcinoma is never encapsulated, while the fibro-adenoma is. If the surgeon be in doubt, I should advise the complete operation.

The *cystic adenoma* is a relatively rare tumor. I have seen but 10 cases. The tumor originated between the ages of twenty-five and thirty-eight. It was fairly encapsulated, and from the capsule there projected minute cysts, 2 to 5 mm. in diameter, with various-colored contents. These must be distinguished from the early adenorcarcinoma which is not encapsulated, but has a condensed outer zone and shows infiltration to a slight extent in the surrounding breast. The little cystic cavities in the malignant tumor are present within the condensed zone. There should be no difficulty in differentiating the benign tumor from the malignant.

Rarely do we see *tuberculosis* before abscess and sinus formation. This disease quite frequently involves only one breast in women between twenty and forty with no evidence of tuberculosis elsewhere.

Contrary to the general opinion, its onset is very infrequently observed during lactation. In the early stage one feels simply an area of induration. At the exploratory incision, in my experience, caseation and tubercular granulation tissue have been present and allowed a positive diagnosis. Up to the present time in some 20 cases complete excision of the breast has been employed in Halsted's clinic, but we have had opportunity to see late cases only. Perhaps in the early stage, in which only a small zone of the breast tissue was involved, excision, with preservation of the remainder of the breast might be employed, especially in younger women.

Non-tubercular mastitis, except when associated with lactation, is a very rare lesion. Yet, I am impressed with the frequency with which indurated areas in the breast, not associated with lactation are looked upon as mastitis, and for this reason operative interference is delayed. Pyogenic mastitis with or without abscess formation and not associated with lactation is possible. I have observed not more than 6 cases among at least 1200 diseases of the breast. It may be secondary to a general infectious disease, to an infection of the arm or axilla, to traumatism, or it may be associated with pyogenic osteomyelitis of the rib. Of course, if one sees the patient after an abscess has formed, the diagnosis is not difficult. But before abscess formation I should never make such a clinical diagnosis, and should always explore such an area of induration.

It is very important for the general practitioner to know that malignant tumors of the breast may arise during pregnancy or after lactation is established. A caking or induration of the breast before the birth of the child in a woman over twenty-five, I believe, should always be immediately explored. In my experience it is either tuberculosis or carcinoma. Lactation mastitis, with rare exceptions, has its onset before the fourth month after the birth of the child. An induration in the breast of a nursing woman, if due to lactation mastitis, should show in a few days either evidence of resolution or the clinical appearance of an abscess. In the latter event incision and drainage are indicated. When the area of induration persists, and yet shows no evidence of abscess formation, one should be suspicious of tuberculosis or carcinoma, and immediately explore the indurated area. I have obobserved 8 cases of carcinoma in the lactating breast and 2 of tuberculosis. In all the onset was after the fourth month; all unfortunately were treated for some months on the diagnosis of mastitis; in only one patient has the radical operation accomplished a cure. What the results of earlier intervention would have been it is impossible to state. I have observed 4 cases of carcinoma which have originated from ten to thirty years later in the indurated area of a lactation mastitis which had never disappeared.

Chronic lactation mastitis, with the formation of a chronic abscess, is possible I have observed but 2 cases. Operation is indicated,

and the differential diagnosis from carcinoma can be made at the exploratory incision. Very rarely does a malignant tumor of the breast suppurate, but on two occasions I have observed abscess formation in medullary carcinoma. Both patients had been treated by incision on the diagnosis of mastitis before they were admitted to the clinic.

The foregoing covers the possibilities of benign solid lesions in the breasts of women over twenty-five years of age. It has been my experience that their naked-eye characteristics are, in the majority of instances, sufficiently clear to allow a diagnosis from the malignant tumors.

CARCINOMA of the breast may be divided into adenocarcinoma, medullary, and scirrhus. The latter two are perhaps more easily distinguished than some of the adenocarcinomas. Pathologically we may subdivide adenocarcinoma into the following groups: Comedo adenocarcinoma (duct cancer); colloid adenocarcinoma; adenocarcinoma beginning in a circumscribed cystic adenoma; adenocarcinoma beginning in senile parenchymatous hypertrophy; and adenocarcinoma beginning in a cyst with a papillomatous growth. This latter group will be discussed under the cystic tumors.

The *comedo adenocarcinoma* begins as a circumscribed tumor. Many of our cases have been clinically doubtful in women over forty. On cutting into this tumor, it is found circumscribed but not encapsulated; the surface shows trabeculæ of fibrous tissue in the meshes of which there are round, granular areas, from the centre of which worm-like comedo bodies can be expressed. The appearance of this tumor is absolutely characteristic—once seen it will never be forgotten. In my experience with 11 cases none has shown metastasis to the axillary glands; all have remained well. As the tumor grows it infiltrates the skin, ulcerates, and produces a fungous growth. Two such patients, one with a recurrent tumor, have remained well a number of years after operation. In this group there have been no late recurrences, but in all the complete operation was performed. It represents the least malignant form of cancer of the breast. But even with these facts, I should not advise a restricted operation.

Colloid adenocarcinoma in its onset is a small, circumscribed, clinically doubtful tumor. At the exploratory incision the tumor has a thin capsule. On section one sees between narrow fibrous trabeculæ bulging pink, gelatinous lobules—an appearance which could not be mistaken for any other tumor. Although I have tissues from 11 cases in the laboratory, the records are complete in only 3, which were treated in Dr. Halsted's clinic. I am of the opinion that this tumor may be multicentric in origin, because, when the first tumor is removed, there have been recurrences in other parts of the breast. In one of Dr. Halsted's cases there were four recurrences after excision of the tumor only before the patient was admitted to this clinic. This patient has been free from any return of the disease

four years since the complete operation. Although the glands did not show metastasis in any of the cases in which the axillary tissues were removed, I believe the complete operation should be performed for the colloid tumor.

Adenocarcinoma beginning in circumscribed cystic adenoma has been described in the discussion of cystic adenoma. This tumor is relatively more malignant than the comedo or colloid type. It has a tendency to infiltrate the breast and to produce a scirrhus or medullary carcinoma. I have observed metastasis to the axilla in 2 cases, which were still pathologically very early carcinoma.

Adenocarcinoma Beginning in Senile Parenchymatous Hypertrophy. This hypertrophy which is called abnormal involution by Warren, of Boston,[2] chronic cystic mastitis by Billroth, cystadenoma by Schimmelbusch, and Réclus' disease by French surgeons, is a parenchymatous change in the breast of women before or during the menopause. It differs in gross appearance from a cystic adenoma only in the fact that it is diffuse and not circumscribed. It is multicentric in origin, and arises in one or more areas of one or both breasts. When it produces multiple areas of induration in one or both breasts, it is not difficult to recognize clinically. When it involves but one area or quadrant of the breast the diagnosis is suggestive, by the lengthening of the diameter of the involved quadrant. I am of the opinion that immediate exploration is always indicated, as I shall discuss under cysts of the breast. When this hypertrophy tends to the formation of single or multiple smooth-walled cysts, cancer is rarely observed. For this reason, in the cystic variety, conservative measures are indicated. But in the second type, in which the cysts are small and filled with epithelial debris or papillomatous growth (the adenocystic type, Bloodgood), carcinoma is a very frequent result. When the lesion is still benign the entire breast should be removed, and in some instances, to be discussed later, both breasts. When the lesion has become malignant, it generally has manifested itself by retraction of the nipple or some involvement of the skin; if not, at the exploratory incision the increase of new connective tissue between the little cysts, and the finely granular areas of carcinoma, which can be expressed, will allow a positive diagnosis of cancer. If the surgeon is in doubt, I should advise the complete operation.

Medullary Carcinoma. This tumor in its onset may be a small, circumscribed, clinically doubtful nodule. I have observed one such tumor but 1 cm. in diameter.[3] At the exploratory incision there is no distinct capsule, and the soft, finely granular friable tumor should not be mistaken for any other lesion.

Scirrhus Carcinoma. The small infiltrating scirrhus usually very quickly manifests definite symptoms of a malignant tumor, by retraction of the nipple or fixation of the skin. But in a few

[2] AMER. JOUR. MED. SCI., April, 1907.

[3] Dr. Welch has just shown me a second case.

cases the patient seeks advice so early in the onset that one only feels in the breast a small area of induration. When such a lesion is cut down upon, the star-like mass of fibrous tissue, containing in its trabeculæ fine granular areas, has such a distinct appearance and feeling to the knife and finger that a diagnosis can be made as readily as with the microscope. The larger infiltrating scirrhus is always clinically malignant.

Scirrhus carcinoma may occur in the breast as a circumscribed nodule, and may feel like an encapsulated nodule, suggesting a tense cyst or adenofibroma. Judging from the specimens sent to the laboratory from outside sources, this malignant tumor has been mistaken for a benign tumor more frequently than any other. A careful investigation, as I have already mentioned, will demonstrate the absence of a capsule, which distinguishes it from the adenofibroma. I take this opportunity to warn surgeons and pathologists not to depend upon the rapid frozen section for the differential diagnosis of these two tumors. The old adenofibroma in which the epithelium-lined spaces are undergoing atrophy, resembles, in the frozen section, a scirrhus.

Cystic Tumors of the Breast. I have recently discussed these before the Johns Hopkins Hospital Medical Society.[4] The galactocele—a dilatation of a duct in the lactating breast—can be recognized by its milky contents; the chronic abscess in the lactating breast by its wall of granulation tissue and purulent contents. The simple cyst, which may arise at any stage of senile parenchymatous hypertrophy, has a distinct wall, a smooth inner surface, and non-hemorrhagic, clear or cloudy contents. The cancer cyst, which has been observed in both the lactating and the non-lactating breast, has a thicker wall, less differentiated from the surrounding breast than the simple cyst, hemorrhagic contents without a papilloma to explain the hemorrhage, or thick, grumous, granular contents due to broken-down cancer cells. A smooth-walled cyst without a papilloma containing blood has, in my experience (6 cases), invariably been carcinoma.

The benign cyst with a papilloma has the same wall as the simple cyst, but projecting from the wall at one point there is a small or large papilloma; the contents may be bloody; there is usually a history of discharge of blood from the nipple. In the malignant papillomatous cyst the distinct wall beneath the base of the papilloma is lost and replaced by solid cancer tissue. The papilloma has lost its characteristic lobulated surface, and usually looks like a soft medullary carcinoma.

I have observed but one sarcomatous cyst of the breast—a specimen sent to me by Dr. Pancoast, of Baltimore. Clinically it was a doubtful tumor in a woman of sixty. Although the contents were

[4] Bulletin of the Johns Hopkins Hospital, April, 1907, p. 139.

clear, the wall of the cyst was composed of soft, friable, granular tissue, specked with blood. Histologically it was a perithelial angiosarcoma. Dermoid cysts may occur buried so deeply in the breast that they cannot be distinguished from primary breast tumors. The benign dermoid has a distinct thin cyst wall and the usual granular dermoid material. In the malignant dermoid the wall is thicker, cannot be enucleated from the surrounding breast tissue, and on section has the granular appearance of cancer. The contents of the malignant dermoid do not differ from that of the benign.

Notwithstanding an indefatigable clinical study of breast tumors from every possible data, and after the most careful palpation, surgeons will meet with tumors in which a clinical diagnosis is not possible, and for which an exploratory incision must be done. Surgeons can train themselves to recognize these tumors at this exploration by the careful inspection of all tumors of the breast the moment they are removed; a microscopic study of the tumors should follow. The clinically doubtful tumor does not differ at all macroscopically from the one in which a clinical diagnosis is possible. Among the malignant tumors of the breast, in the majority of clinics in 90 per cent., the surgeon will be able to proceed with the complete operation without an exploratory incision, so that he will have an average of nine opportunities out of ten to familiarize himself with the gross and microscopic appearances of carcinoma, and thus prepare himself for the few cases in which the tumor must be recognized at the exploratory incision. With this training the surgeon will subject his patients to the complete operation for carcinoma only when the tumor is really a carcinoma, and he will not mutilate his patients suffering with benign lesions unnecessarily, nor will he make the fatal mistake of doing a conservative operation for cancer. I should advise that, until this knowledge is gained, it is better to perform the complete operation in doubtful cases. On the whole, less harm will be done and more good accomplished. Cancer of the breast cannot be cured when the tumor is first excised for microscopic study and the complete operation performed later. The complete operation must follow *immediately* the exploratory incision.

There are two other very interesting problems in the operative treatment of breast tumors. The answer to the first I cannot give at the present time. But I am impressed with the fact that a certain form of carcinoma is very frequently bilateral. At least a number of patients return with similar carcinoma in the other breast. I am investigating at the present time whether it will be possible to isolate these cases, and whether when we perform the complete operation for the tumor in one breast, we can, with some justification, remove the other breast, because the pathology of the tumor removed indicates with great probability that later a similar tumor will appear in the other breast. I shall have to leave this for a future communication.

The answer to the second problem, I think, can be given. When the surgeon cuts down upon a clinically doubtful tumor in a woman before or at the menopause, and finds a benign tumor—an intracanalicular myxoma, an adenofibroma, a cystic adenoma, or a small simple cyst—and during the dissection of this tumor his investigation of the surrounding breast tissue demonstrates the presence of senile parenchymatous hypertrophy of the adenocystic type, I am confident this breast should be completely removed. As this disease is so commonly bilateral, it has been my practice the last few years to remove both breasts. In my first case, some eight years ago, the patient refused the double operation. She succumbed to cancer of the other breast five years after the operation

Sarcoma of the Breast. I have never observed a sarcoma in a small intracanalicular myxoma. I have discussed this probability in the larger tumor, and the rule of the more extended operation. Primary sarcoma of the breast not arising in intracanalicular myxoma is a rare tumor. I have observed but 2 cases. They may not be distinguished from medullary carcinoma, but can be easily differentiated from any benign lesion. The rarity of the diagnosis of sarcoma in the Surgical Pathological Laboratory of the Johns Hopkins Hospital may be due to the fact that we have called some sarcomas medullary carcinoma, and I have a group of medullary carcinomas which I have separated as resembling sarcoma. The complete operation has always been performed, but up to the present time no cure has ever been accomplished, except in the sarcoma which arises from the intracanalicular myxoma, and here only when the major pectoral muscle has been removed.

I have not mentioned the non-indigenous benign tumors of the breast—lipoma, fibroma, enchondroma, and the so-called mixed tumors of the breast. We have had but one example of each, except the fibroma. They were easily recognized.

SOME FUNDAMENTAL PRINCIPLES IN THE TREATMENT OF FUNCTIONAL NERVOUS DISEASES, WITH ESPECIAL REFERENCE TO PSYCHOTHERAPY.

By Joseph Collins, M.D.,

PROFESSOR OF NERVOUS AND MENTAL DISEASES IN THE NEW YORK POST-GRADUATE MEDICAL SCHOOL; ATTENDING PHYSICIAN TO THE NEW YORK CITY HOSPITAL, NEW YORK.

Nervous diseases have acquired an undeserved reputation for incurability and unamenability to treatment. This reputation antedates their recognition, description, and interpretation, and is founded in ignorance. Like all bad reputations, it is difficult to overcome, and, however humiliating the admission may be, it must

be granted that physicians have not done their best to give these diseases a good character. But I do not wish to spend time in comparing them with other diseases from the point of view of curability, for that would serve no purpose other than to reiterate that which I have often said, viz., that nervous diseases yield more uniformly to treatment than any other class of diseases of comparable nature and severity. It is, of course, understood when I speak of diseases influenced by treatment that I do not include self-limiting diseases. I desire rather to present a brief sketch of present-day therapeutic tendencies from the point of view of the practitioner who has much to do with nervous diseases, instead of a *resume* of therapeutic novelties in neurology. Practically, all nervous disorders and diseases are chronic. The organic are painful, incapacitating, and deforming; the functional, more potent to cause misery and suffering than any other form of disease.

There are certain cardinal principles in the treatment of all nervous diseases, principles which obtain as well in the treatment of all chronic disease, but which are more important in the former because, constituting as they do a moral and disciplinary *regime*, they make leading appeal to the patient's mind, and the mind has a more commanding dominion over this class than over any other. Were I to say that a correct diagnosis is by no means necessary for the successful treatment of many neuroses, I might be looked upon with suspicion and hailed as an apostle of retrogression. Still, I make that statement, trusting that I may be understood, and, as evidence of the truth of it, I submit the testimony offered by faith curists, christian scientists, osteopaths, shrines, charlatans, and "systems" innumerable. No one denies, I fancy, that actual cures of apparently real disease are effected through these agencies, and in some instances after the legitimate practitioner of medicine has tried and failed. Yet in each of these instances a diagnosis was lacking. I am not now attempting to show that a diagnosis is not a most desirable factor in the successful treatment of any disease, for it is naturally the only way of safe-guarding the sick. I am merely emphasizing the fact that no source of knowledge is too mean or contemptible for us to disdain it, and, that it does not detract from the dignity of our calling to admit the instructive value of these sources. Whether or not there have been periods in the history of civilization in which the supernatural, the mediatorial, and the "miraculous" have been more invoked and utilized in the treatment of disease than they are to-day cannot, I think, be determined, but that these are rampant at the present time is obvious to every thoughtful person. This condition of affairs may be interpreted as evidencing (1) that the mind has a not easily calculated influence over the body to influence it beneficially or detrimentally (which everyone knows or professes to believe); (2) that this influence is being utilized meretriciously (as must always be the case) by many persons outside of

the medical profession; and (3) that ignorance or neglect of the important part played by moral treatment in the cure of nervous disease necessarily tends to our discredit in the exact ratio in which it tends in the given case to the patient's disadvantage.

It is not alone in the so-called functional diseases, such as the neuroses and psychoneuroses, that moral treatment is efficacious. It may truthfully be said that in the organic diseases, aside from those caused by syphilis or dependent upon syphilitic lesion, it is far more efficacious than medicine. Yet what is heard of it in our medical schools? Think for a moment of the countless words that have been said and written about the innumerable substances that are remediable in tabes, in myelitis and disseminated sclerosis, in epilepsy? And what has it profited? It has served only to show in these, as in all nervous diseases, that medicine by itself alone is practically worthless.

The physician whose work lies with neuropaths has it forced upon him sooner or later that it is the plan of treatment, embracing as it does the systematic utilization of measures that have been shown experimentally and empirically to restore bodily tone, to improve general and local nutrition, to add functional potentiality, to aid in dislodging fear and overcoming that infirmity of the will, want of self-reliance—it is the plan of treatment that must be taught and practised if we would be just to our patients and true to ourselves. And it is this plan of treatment and all that it stands for in conjunction with the means employed to get possession of the real facts concerning the patient's ailment that spells psychotherapy.

How difficult it is to formulate this plan of treatment and put it in words that are not trite and expressive of sentiments that are not commonplace, no one can know who has not essayed to do it. This is the chief obstacle in the way of systematic instruction along these lines in our medical schools and hospitals. I am opposed to the claim that it requires special skill to treat nervous disorders successfully, and I contend that the general practitioner should study the proper manner of treating them, with the same care that he studies infant feeding or the treatment of typhoid fever.

The first and perhaps most important thing in the successful treatment of nervous disease is to convince the patient that his disorder is fully understood, that the features of it, which in his judgment are unique and mysterious, are perceived with a clarity that amounts almost to clairvoyance, and that the physician stands between him and danger. This may be called "inspiring confidence," but it is really much more than this, for the patient may have confidence in a physician's skill and judgment without harboring any of the above-mentioned convictions; nor is this relationship between the physician and the patient to be established by verbal assurance on the part of the one and the most explicit statement on the part of the other. That to which I refer is a sentient condition of the

patient that develops unconsciously, a condition which may be created by careful and solicitous attention to his story, by judicious imparting of result of a comprehensive and minute examination, by observation and conclusions based thereon, and by appropriate psycho-analysis. Each one of these plays its part, and one may not supplant or replace another.

The longer I study patients and the more intimately I become acquainted with their infirmities, the more I become convinced that imaginary maladies are very rare, and when they occur they are real! Patients are apprehensive of the seriousness of their symptoms, they anticipate disaster, they dread impending occurrences that they cannot withstand, but these do not constitute the symptoms of an imaginary malady; they constitute the symptoms of disorders of which fear and want of self-reliance are the principal features. Neither does it avail to tell such sufferers that there is nothing the matter with them, nor to treat their confidences lightly or indifferently. No normal, healthy minded person willingly brings such misery exciting phenomena into his consciousness. If the physician takes the trouble and employs the means to determine the genesis of these, and of perhaps even more terrorizing fears, he will be in a much stronger position in the effort to dispel them after he has impressed the patient by his mode of eliciting the details underlying his emotional status. One of the things which frequently impresses nervous patients most favorably is the realization that the physician knows without being told what his symptoms are better than the patient himself does. Such knowledge may come from experience or it may come from what is commonly called intuition, which is really observation and inference—that quality which so many of us find entertaining in Sherlock Holmes. But few men can hope to vie with Hadig and Sherlock Holmes in this keen observation and unerring deduction. Hence the so-called psycho-analytic method has a field of usefulness and a brief mention of the part that it plays in the treatment of nervous diseases becomes necessary.

It is well known that patients with that peculiar group of symptoms that are subsumed under the captions of neurasthenia and psychasthenia have often great difficulty in formulating their complaint, or, to employ legal phraseology, in furnishing a bill of particulars, of their complaint. They know that they are apprehensive, agitated, anxious; that the voices that they hear in solitude are dominant; that there is no peace of mind, no contentment, no happiness for them; but they are unable to say why this is so and whence it comes. Then again there are many patients with obsessions, fears, self-depreciation, morbid conscientiousness, and conduct and emotions based upon these emotional states, who are entirely ignorant of the causes of their condition. Indeed, it is ofttimes for the cause as well as for the relief of these symptoms that they seek counsel. It is in such cases that the so-called psycho-analytic method is of great impor-

tance. This method is based upon the association of ideas; upon the common knowledge that memory ideas are associated with sense impressions. Everyone knows that an object or word seen or heard, an environment, a sound, an odor reminds us of something concrete or something which in turn brings up other associations of time, place, or emotion. Psychologists have determined the conditions under which these associations arise, the influence which the frequency and the recency of the memory picture and its associated ideas have upon the kind and character of the evolved impressions as made manifest in the resulting idea. The time that elapses between the articulation of a word and the mental photograph which expresses the idea that is invoked in the hearer's mind is called the reaction time. Experimenting with a large number of words, we find that the normal reaction time for the average individual is very short, generally less than a second, and is not subject to much variation. For some words, however, if a long series of words be tried, a much longer time elapses before a verbal association is announced, oftentimes four seconds and more. Repetition of the test at different times shows that it is always the same words that have this protracted reaction time. If these words are selected and collated, it may not infrequently be seen that they have some personal association or reference, and, taken alone or in conjunction with the patient's story, they may be used as the key to unlock the latent memories that are, consciously or unconsciously, disturbing the patient's peace of mind. Then once they are brought up where they can be squarely attacked, they may be subjected to well-recognized modes of psychical or moral treatment.

The so-called method of psychic analysis and its application therapeutically is based largely upon investigations of Breuer and Freund, of Vienna, more particularly the latter, who sought to detect the primary appearance and manifestation of certain symptoms in hysteria, psychasthenia, and neurasthenia, and, having in many instances detected them, contends that hysterical individuals suffer from reminiscences of a distressing character, which act as disease producers after the lapse of years. These pathogenous recollections refer to unpleasant occurrences which have not been sufficiently "dispelled," that is, to which adequate reaction failed to occur; such reactions are tears, laughter, an act of vengeance, complaints, motor outbursts, etc. Man tends to "externalize" his psychic emotion. If appropriate reaction fails to occur, the mental imprint of the occurrence retains the "emotional accentuation," as is the case, for instance, in an unretaliated insult. Ideas which are no longer emotionally accentuated disappear in the course of time, according to the process which we designate as "forgetting."

Imperfect reaction is doubtless dependent upon existent conditions in the particular case. The emotional factor may be so excessive in degree that all ways and means of reacting prove inadequate.

Or the patient may have temporarily "pushed aside" some painful concept from his conscious thought, in the endeavor to forget it or to drive it away from his consciousness.

The attempt of the individual to get rid of the painful concept by pushing it aside is apparently successful; but somewhere and somehow in the psychical organism the painful concept persists and, possessing a "traumatic" value, acts as the stimulus of an irritation on the nervous system. These "irritations" form the symptoms of various nervous diseases. A neurosis represents the reaction to endogenous stimuli. The important thing after this subconscious pathogenic stratum is laid bare is to deliver the patient of it. Freund avails himself of hypnosis and similar methods. Therapeutic success is a relative test of the accuracy and completeness of the patient's statements. As soon as the reminiscence has been transferred into waking consciousness, the symptom subsides. The therapeusis is to render the subconscious accessible to consciousness, and this is accomplished by overcoming the resistances. In severe cases this psycho-analysis becomes an extremely difficult and protracted task. Freund estimates it at from six months to three years.

The power of interpreting the significance of psychic phenomena can doubtless be acquired in some measure by everyone. As Jung[1] almost sarcastically remarks, "Anyone may repeat association experiments at his pleasure." The question always remains of what value may be his deductions? Natural aptitude and experience will determine the extent to which the practitioner will acquire facility in interpreting the results of a psycho-analysis. Some may find themselves unfitted for this work. Not every physician is *ipso facto* a surgeon—nor would be such—and many an able surgeon would willingly seek medical counsel when presented with the intricate problem of an infant's inarticulate complaint.

NEURASTHENIA AND PSYCHASTHENIA. One of the most important steps that have been recently taken in the extension of our knowledge of the neuroses is the establishment of the condition known as psychasthenia, in contradistinction to neurasthenia. It may be assumed that the word neurasthenia now has a fairly definite meaning attached to it. It may still be used rather loosely by the laity, but when a physician says that a patient has neurasthenia, he means that his patient has a general depression of the nervous system and asthenia of the entire organism, psychical, sensory, motor, vasomotor, trophic, etc., and particularly characterized by mental depression manifesting itself in the attention, in the memory, in volition, and in other dominant mental qualities, and accompanied by symptoms that are so constant as to be considered stigmata (headache, insomnia, muscular weakness, gastro-

[1] Münch. med. Wochenschr., 1906, p. 2302

intestinal disturbance, peculiar mental state), and other symptoms subject to great variation, referable to different organs of the body, constituting the circulatory, the visual, and the genital systems. Neurasthenia is a sign of the times. Strenuousness is the soil in which it flourishes. But we shall not discuss its causation, which would involve much enumeration of predisposing conditions, nor its manifestations. I wish more particularly to call attention to the condition known as psychasthenia, a name given by Janet to constitutional psychoneurosis, usually hereditary and characterized by psychical and physical symptoms, obsessions and impulses, fears, anguish, tics and aboulia. These symptoms have long been known to physicians and especially to those interested in nervous and mental diseases, but it is only recently that they have come to be looked upon as factors of autonomous nervous or mental disorder.

Psychasthenia as a disorder has its origin in a neuropathic constitution which is inherited, not acquired. It is quite different from neurasthenia, although neurasthenic symptoms are usually associated with it. Indeed, it may be said to induce neurasthenia, and the somatic accompaniments of the disorder, objective signs and symptoms, when there are any, are those of neurasthenia. The chief mental symptoms are obsessions or compulsory ideas which come into the consciousness abruptly and take possession of it autocratically, usurping to any degree the normal content of the mind. The patient makes his best effort to prevent them or to circumvent their dominant operation, but to no purpose. They are inimical to ordinary habits of thought, and while operative, the victim is given over entirely to their sway, though he can usually inhibit their externalization and even conform his conduct to what seems to be normal. It is fortunate that this is the case, as the obsessional idea is quite often the opposite of that which normally characterizes the individual, and if it were acted upon, disaster to others, often to those of whom he may be fondest, would be the result. The patient realizes how morbid the thought engendered by the obsession is, and he can reason about it, discuss its various ramifications, and in a general way conduct himself toward it while analyzing and attempting to interpret it, as if it were the possession of another person, but even while so engaged he feels that he is within its grasp and that he has no power to free himself from it. Many instances, such as stealing, incendiarism, and other criminaloid acts, naturally may be the immediate sequence of such obsessional condition.

The second striking feature of the psychasthenic is a symptom which resembles this mental or emotional symptom that we have been describing, but which manifests itself usually in some form of motor display, such as a twitching movement in some part of the body, usually one of the extremities, to which the name tic is given. These tics may be simple or they may be so associated that they are spoken of as systematized, or the motor display takes the form of

some compulsory process such as senseless repetition, useless movements, overwhelming necessity for performing certain acts in a definite manner, such as stepping on a crack, taking so many steps in one direction, so many in another, and so forth in an endless variety; or, it may take the form of certain kinds of mental agitation, associated with counting and repeating, inquiring, doubting, etc. It is among these simple or systematized emotional agitations that morbid fears of every kind are to be included, fear that such and such conduct is not right, fear of disease, fear of animals, morbid scrupulosity, etc. And finally, the more common distinguishing feature of psychasthenia is the absolute lack of self-reliance. The psychasthenic hesitates to adopt a plan of action, he is irresolute about decision of all sorts, he is self-deprecatory, oftentimes to an absurd and apparently ludicrous degree, taken in conjunction with what appears to be excellent health, and he is consumed with a timidity and fear which the normal individual has great difficulty in realizing, but to which the victim himself is keenly alive.

TREATMENT. The treatment of psychasthenia, like the treatment of nervous disease founded on degeneracy, consists of two things: Treat the patient and treat the chief factor of the disorder, that is, heredity. Discussion of the latter does not come within the scope of these remarks. The problem that confronts us is what to do with the individual who comes as a patient.

The patient with neurasthenia will usually yield to treatment when the cause no longer exists and the general health has been restored. Such restoration usually follows the proper use of rest and exercise, massage, thermal and mechanical agencies, and the disciplinary entailment of such treatment. But in the majority of instances the patient with psychasthenia will not be cured without much more searching psychotherapy. As a teacher I find great difficulty in stating specifically and explicitly of what such treatment consists. It entails instruction in logic, in dialectic, in philosophy, stripped of all scholastic verbiage, and presented in the shape of plain statement of fact concerning the origin of the patient's ailment, the manner of its development, the reasons why it will be overcome and how it will be overcome, constantly holding up that happy contrast when it is overcome. Finally, we must engender a spirit of self-reliance and courage which is entirely inimical to fear and doubt. We must teach the philosophy that engenders a willingness to bear temporarily the frailties of the spirit and the flesh with the same fortitude that the mother bears the pain and suffering of childbirth, because of the flood of happiness that comes with the reward. We must conquer fear, dispel doubt, eradicate despair, and in the soil from which they have been uprooted we must implant seed which shall b'oom as hope, courage, contentment, equanimity, and self-reliance. In order to do this, one must have it in one's self. As Emerson says: "When good is near you, when you have life in yourself, it is not by

any known or accustomed way; you shall not discern the footprints of any other; shall not hear any name; the way, the thought the good shall be wholly strange and new. It shall exclude example and experience You take the way from man, not to man. All persons that ever existed are its forgotten ministers. Fear and Hope are alike beneath it."

Then there is that vast and far-reaching matter of suggestion that comes up for consideration in this connection. What is suggestion, how does it act, and how shall it be carried out? Take for example the literature that has developed concerning hypnotism, the therapeutic utility of which depends upon suggestion. Hypnotism is very little used by physicians today, because it has been found impossible to divorce it from the magical and supernatural, to draw from it the veil of mystery and the trappings of occultism. Furthermore, not improperly the trammellings of prejudice seriously interfere with its use, at least in this country. Yet we all admit that hypnotism is a potent way of using suggestion and we should be grateful in that it has assisted in establishing the value of that measure. But the potency of suggestion is quite as great without the mediation of hypnotism, though its application be not so tangible and direct. The suggestion that emanates from environment, isolation, painstaking care in the application of physical measures, from verbal assurance, from putting in proper perspective evidences of recovery even though they are slight, from all that is included under the head of discipline and obedience, cannot be too strongly emphasized. "Who has more obedience than I, masters me though he should not raise his finger."

It is not sufficient to show a psychasthenic that his ideas are not founded upon facts, that his actions or conduct do not flow from logical and legitimate inferences. It is necessary first to attack the fundamental state upon which these pathological, ideational, and emotional states depend. Ordinarily the most expeditious way of going about it is to restore or at least improve the general health. This is to be done by the proper employment of those measures which have been found so successful in neurasthenia: Isolation, alimentation, rest and exercise, and the use of such mechanical measures as massage, hydriatic procedure, electricity, and possibly also the use of symptom medicines. They of themselves or the discipline which they engender constitute the most important factor in the moral treatment of these patients, and the time when they are operative is the psychological moment to begin the moral treatment. At a definitely allotted time in the day the patient should be made to concentrate his attention upon work that requires his intellectual faculties and which is entirely foreign to self-contemplation, self-analysis, and introspection. It is in this respect that for example appropriate literature may be of great service. The patient may be made to read, or study rather, Plato or Emerson, or Marcus Aurelius, although in many instances I have to put them upon the baby diet furnished by Horace Dresser

and other apostles of the new old thought who present their matter in a very simple way. Once the patient can concentrate his mind upon the Phaedo, or such excursions in the realm of independence and optimism as Emerson's Self-reliance and Compensation, and by perhaps a veritable *tour de force* shut out their morbid ideas, the dawn of recovery is at hand. Naturally such work is not pleasureable, but neither are some, perhaps all, of the physical measures that are at the same time being utilized to restore the patient's bodily health. It is done as a task, and it should be done with the seriousness and studiousness of a task, and with the same regularity and persistency as any of the physical methods co-incidently employed. Neither is it done alone; it is done in intimate association with some competent person, or with the physician who essays to treat him. After a time the task which seemed impossible and wholly beyond the patient's comprehension becomes easy and pleasant, and he extends his activities volitionally in directions which are indicated to him. Naturally in the beginning the pathological ideas assert themselves, and the physician is likely to be impressed with the aboulia and distractibility of his patient, but there are few cases that resist confident and protracted effort along these combined lines. Gradually there is brought about a reëducation of will power, a keenness and intensification of intelligence, and an expansion of sentiment. The patient's resources are increased. Life begins to have some charm for them, existence some purpose, and with the aid of the staff which the physician puts in their hands to steady them over trying and difficult situations, many patients are restored to useful lives, some to distinction and eminence.

Then there is that large number of individuals who are neither neurasthenic nor psychasthenic, but who have a type of mental and emotional make-up that renders them prey to obsessive states of mind, and who, though not invalids in the strict sense of the word, are often in greater need of the physician's services than one who is frankly ill. Of this class is one, who constantly questioning his decisions, hesitates in conforming his conduct to it after he has made up his mind. He not only looks before he leaps, but lingers, and often lapses. Also one who takes some incident of the past, often of comparative triviality, but which permitted some latitude of conduct or display of judgment, and maintains that it—the conduct or judgment—has been prejudicial to others' welfare and detrimental to himself. He dwells upon this until it loses all proportion prospectively and retrospectively to other and important incidents in his life. Such is one who finds it difficult to realize that the Lord and the Law are satisfied with one's best, and who will not understand that what is one's best yesterday is not his best today. He debates with himself the effect of certain actions or course of conduct upon himself and upon others. On having done an act even the simplest, he begins to feel and display concern that it has

not been done properly and adequately. He feels impelled to do it again, and so on through a long list of doubts which embrace every modality of conduct. Many individuals have some one or more of these in a rudimentary way who are in no way psychasthenics, neurasthenics, or hysterics, and this is the point that I wish particularly to emphasize. They are neuropaths or deviates to use the appropriate word which carries with it neither obloquy nor opprobrium which was suggested by G. L. Walton, one of the soundest writers upon this subject, but they are not sufferers from a psychosis or neurosis of degeneracy. These distressing and hampering qualities of mind to which I have been referring are conditioned in part by inheritancy and in part by bringing up. I am willing to admit they are conditioned entirely by inheritancy, but proper bringing up can eradicate or overcome them. The rules of conduct applicable to the phelegmatic, the careless and normal are not applicable to the nervous symptoms and deviate child, and maxims embodying such rules are often most pernicious to the latter. The importance of eradicating obsessive states of mind before the individual's character is developed and set is self-evident, for it must be done by substituting legitimate, logical, mental process or thought for errant, obsessive states of mind. Paternal and pedagogical coöperation along these lines would diminish the sum total of misery in the world and curtail the number of neurasthenics and psychasthenics.

THE PATHOGENESIS AND TREATMENT OF NEURASTHENIA IN THE YOUNG.

By Robert N. Willson, M.D.,
of Philadelphia.

It is a bold man that dares do more than hazard a theory to explain even a given phase of this oldest complex of symptoms—neurasthenia. The vast majority of medical men leave it grimly alone. Clifford Allbutt says of it: "As insanity and epilepsy, so neurasthenia had, no doubt, its sphere in all ages." Certainly today, if we are to judge from our books and the current teaching, medical men are no nearer an understanding of a definite pathogenesis for the condition than were the ancients, who observed it almost as intelligently as we.

"Overwork, nervous exhaustion," is the hue and cry! Allbutt replies, "Neurasthenia is found no more in the busy citizen than in idle damsels," and every student of the subject is forced to acknowledge that he speaks truly. In so doing we contravene the popular impression and bid them cast from them that most heartily welcomed of all the many theories proposed, namely, nerve-stress and nerve-tire. I

wish rather to indicate the general lowering of tissue *nourishment* as the primary process, and the upbuilding of this function as the means of cure. Nerve-tire I believe to be simply a symptom, or a result, and still more remote should be the emphasis upon the signs of nerve-tire. This lowering of tissue nourishment may be dependent upon one cause or another, and only a part of the picture is the lowered nutrition of central and peripheral nerve tissue.

It is the object of this paper, therefore, to direct attention to the fact that, at least in the young, every instance of so-called neurasthenia is in the beginning the result of some definite, preventable, and discoverable cause, which if removed in time will admit of a cure of the patient. In one type there may be found a given influence, in another one entirely dissimilar, and in a third and fourth others bearing no resemblance to either of the foregoing; and so almost *ad infinitum*. Whatever the type, cerebral, cerebrospinal, sexual, gastric, or circulatory, there is always a definite, conquerable factor that is allowed to acquire control of a mind and body that should never have been yielded up to its power.

The following four instances of so-called neurasthenia in the young were referred to me by physicians who had in each case treated the nervous symptoms and failed of cure. In each of the four a detailed study was impracticable for the home physician, owing to circumstances of environment or equipment. In each a definite, influential factor was determined, which, when removed, left the way open to a recovery, which has been accomplished in every case. As usual there will be noted cardinal features common to the four. Each furnished, however, as distinct and separate a picture as though related to the others only by cousinship, as it were. As regards the causal conditions, it will be seen that certain influences were at work in the entire series, while each and every patient had given way under a cross peculiarly his own. All were from refined surroundings, and three enjoyed every comfort that money could buy.

Case I occurred in a boy of eighteen years, who inherited a distinctly neurotic tendency on both his father's and mother's sides. He had had none of the child's diseases, never typhoid fever, rheumatism, or a venereal infection, and, so far as could be determined, had never masturbated since first taught the practice at about thirteen years of age. He was brought to me on September 18, 1905, with the history of a fall four years before, following which (in his own terms) "his back troubled him constantly; no real pain, it simply ached; he felt exhausted; could not walk; seminal discharges began and occurred almost nightly; felt he was morally weak, not bad; all this continued to summer of 1904, when he went to the Adirondacks and improved slightly; then went to an outdoor nursery garden, and rapidly became worse, weaker, listless, tossed and turned at night, seemed to friends to be nervously exhausted; on return a month or two later could not fix his attention; to try made him sick for a day;

had emissions day and night, sometimes of fluid, sometimes merely the sensation; discriminated between ordinary and 'nervous' emissions; was sent to Asheville in May, 1905, to his uncle's, where he gained at once and seemed to be getting well; was there six weeks, when his eyes began to fail, hurt him, etc.; eyes then examined by an oculist, who found he could not see to read; returned home in June, 1905, at which time eyes were again examined and only a slight astigmatism was found. Was then examined by two physicians in this city, who had merely one opportunity to study him, and advised him to lead an outdoor life."

The father added the following data: He had just brought the boy from the South, and in order to get him to come had to lift him like a meal-bag and dump him in the bottom of the buggy and drive to the station; then lift him into the train. During the last month he has complained of hot flushes, has been very constipated, eyes distress him, he constantly presses his fingers against nose and lips to relieve the eyes, lids painful, some secretion, much worse after emission, no pain in his back for months, nor pain anywhere, but uncomfortable everywhere; once had an infantile hernia, and wore a truss therefor; testicle was pressed out of place by truss and disappeared; came down only a year ago, and is now very small. A few weeks before reaching Philadelphia the boy had gone to the country, weak and without interest. Suddenly, one day he was found in bed, pale, still, everyone thought he was dead. Dr. Hiram Woods, of Baltimore, saw him on this occasion and brought him down to supper. Father then brought him in the buggy, thirty-two miles, to the station. The urine and the blood had never been examined. When seen in my office the patient appeared to be a pale, thin, very tall and broad boy, looked me fully in the eye for a second, then dropped eyes to the floor. Sat with head in hands, eyes on floor, when allowed to do so. Skin pale, but hands warm; pulse, 100. The only abnormality in the mouth consisted of the two raw stumps of the tonsils, which had been excised by Dr. Ziegler three days before. Marked pulsation in the carotids. Chest poorly developed, round-shouldered, droops the right shoulder, marked depression in the anterior right thorax near the sternum. No signs of pulmonary involvement, except for failure of extreme right apex to expand, and of the breath sounds to enter apex except on forced effort. Slight abnormal curvature in dorsal and lumbar spine. The heart was dilated, the rhythm perfect, the action irritable and angry, and a suspicion of a systolic blow in the apical region. The abdomen was negative. The pupils were dilated, the reflexes of the eyes were present, though sluggish. All other reflexes were normal. The right testicle was very tiny and quite soft, the left testicle normal. Weighed 125 pounds. Malarial plasmodia were found in the blood, of which the hemoglobin reading was 64 per cent.

At this time (September, 1905) the mental condition of the boy was decidedly abnormal. He could not be persuaded to help himself in any way. Could not sleep at night because he heard a buzzing in his room. His father, after an hour's search, found a fly caught in a spiderweb, far across the room, whose struggles no one else could hear. He wanted always to be alone, sat with his eyes on the ground, and asked only that he be not bothered. He admitted, with tears in his eyes, that he wanted to get well, and that he was ashamed of his mental and moral condition, but had given up hope, and could see no use in trying further. He agreed, after some persuasion, to obey orders, however, and on this basis I agreed (with the boy, of course) to take charge of him.

From this time until February, 1906, I guided his entire day, having with him at all times someone who would see that he was kept continually under supervision, whether sleeping or waking, and directing that the main effort should be bent toward tiring him by physical exercise in the fresh air morning and afternoon, with rest between in large doses. At first he was able to do little, owing to his cardiac dilatation. Surprisingly soon he was showing a gain in endurance, and with steady improvement of the cardiac action. I then drove him, often with tears in his eyes, to his work, which otherwise he would not do, except when reminded of his promise to obey every instruction. He protested that it was physically impossible, and I forced him to demonstrate that it was possible. Daily I spent one hour with him in the gymnasium with the windows open wide in the middle of winter, and did first what I wished him to do. He began with one egg and a glass of milk as his only food in the day, and in three months was using six eggs and two quarts of milk daily, besides three full meals. Every remnant of food was cleared from the system by artificial means before the first meal of the next day, whether the bowels had moved naturally or not. Bathing, clothes, and mental training were all directed by the day, every move being explained to him, and my office being open to him for a visit whenever he could find me to ask a question. In short, I carried the boy mentally, morally, and physically for six months, and during the last three had the pleasure of seeing him begin and gradually assume charge of himself.

For the past six months he has been at school, has weathered a severe bronchopneumonia and is again well, has nearly regained the twenty-five pounds that he had added under our *regime* (weighing 150 pounds before his pneumonia), and has just determined for himself during the last week that his mind is at last clear, and that he "can now will and do what he wants," and is to all intents and purposes a well man. He had never had delusions, but he had been as nearly without initiative or power of mentality as I have ever seen a human being that was not insane; and today he has it in his own hands, I believe, to say whether he shall retain his mental and physi-

cal vigor, under Providence, of course, or whether he shall allow mind to follow body back into the slough of despond. The only medicines used during the course of treatment were, in the beginning, quinine and iron, such as would control the seminal emissions, and later cardiac tonics. His eyes have been pronounced normal by Dr. de Schweinitz, and he has even discarded the glasses which he had believed the only hope of cure, and does his work at an advanced boarding school along with a class of healthy boys. About the middle of his course of treatment Dr. Ziegler cauterized the erectile tissue in both nasal cavities.

CASE II was one of a young woman whom I had known from childhood, and who was referred to me by Dr. Edward Martin. On both sides she inherited a strong neurotic tendency. One brother and two sisters living, all high-strung and sensitive. Father had severe headaches in youth, and patient has same affliction. The attacks take the form of an almost typical migraine, with nausea and often vomiting prior to relief. She has a slight curvature of the spine, once had an abscess of the middle ear, has had malaria, and also two seemingly authenticated attacks of typhoid fever, the last four years ago. Has had influenza several times. Took the rest cure under a Philadelphia neurologist five years ago, and was in bed two months. A number of years ago was under the care of a woman physician here, who corrected a retroflexion of the uterus, causing her to wear a pessary. Has never felt well in life. Always worries, and tires easily with mental and physical effort. Menses always irregular, leaving her completely prostrated. Always a "bilious" color. Pressure from her clothing seems constant; occasional palpitation of the heart. Admits that she eats too much, drinks coffee twice daily. Has involuntary sexual dreams and sexual excitement very frequently in the early morning. Has masturbated very frequently for years, and still continues the practice. Is much depressed, and very discouraged over the failure of her physicians to cure her. Says I am the "last physician she shall ever allow to make a fool of her."

She came to me on January 25, 1906, at which time she was pale, sallow, her lips almost blue, and her nose, hands, feet, all cold and clammy. Breath foul. Arteries soft and normal. The cardiac action was rapid (90), the second pulmonic sound everywhere accentuated, also less so the second aortic sound; there were no murmurs. The right pulmonary apex showed a slight catarrhal involvement, the left lung was negative. The spinal curvature was very marked to right and left (spiral). No tender areas in spinal column. No areas of anesthesia over body. No hysterical stigmata. Reflexes slightly increased. Both plantar arches completely broken down. The hemoglobin read 70 per cent., the red blood cells 2,928,000, the leukocytes 3400. No malarial plasmodia. The urine and the stools showed nothing abnormal, no parasites, and no ova. The right kidney was freely movable, enlarged, and very tender to pal-

pation. The remainder of the abdomen was negative. The mental condition was strikingly gloomy, and the patient seemed to wish to die, considering her existence a burden upon others and herself of no advantage to anyone.

A schedule in the main similar to that of Case I, though by no means so strenuous, was outlined and the patient's firm promise secured that it would be followed to the letter. Repeatedly, however, she came to my office merely to say that she was not fulfilling her promise, especially with regard to self-abuse and exercise in the open air. The program was started afresh each time and the patient treated much like a young child through the greater portion of three months, when she began to show a marked change for the better, not only in appearance but in confidence in her ability to do and to be of use. From that time until now there have been frequent lapses, even the habit of masturbation not having been thoroughly mastered. The patient is now, however, the centre and mainstay of the family, and as happy in her certain recovery, which she is helping to bring about, as any little child over a toy, or a conqueror over a battle won. The only drugs used were iron, strychnine, and laxatives, the former two only in the beginning.

CASE III resembled Case I in everything except the degree of mental and physical depression. He also was a young man, about twenty-eight years of age; on his mother's side of intensely neurotic stock. He was sent to me after he had gone the round of the sanitaria for the rest cure. He was in a mental depression so profound that, like Case I, he lacked only the delusions to warrant the diagnosis of melancholia. He had held, and again fills, an important position at the head of a department of a large factory in this city, carrying much responsibility. For three years he had overworked at high pressure. He was sent to me on May 20, 1906, with the history of severe attacks of all the diseases of childhood in early years, even scarlet fever, and recovery from all. Since childhood he had been healthy, and engaged in athletics until three years ago, when "he began to realize he was sick." He was worried over little things, he tired easily, his eyes began to trouble him, he was constipated, his feet and hands were always cold, and seminal emissions were becoming more and more frequent, each one leaving him depressed for the day. Very depressed mentally. Had consulted a number of physicians, and had just returned from several months spent at a sanitarium at Wernersville. Had gained a little in weight, but was worse than ever mentally, and "almost feels that he cannot get well."

When examined by me on May 20, 1906, he was thin, bleached, hands cold and clammy, mucous membranes all pale, pulse fairly good (90). The heart sounds clear, the second sounds both accentuated, no murmurs, no arrhythmia. The abdomen was absolutely negative. The lungs showed no abnormality. The pupils were dilated. All reflexes were present, and the tendon reflexes slightly

exaggerated. His mental condition was pitiful. As he sat in the office during the examination he appeared like a frightened animal, and at the conclusion of my examination he said he "supposed there was no hope for him." I met him on the same day in the gymnasium and inaugurated a *regime* very similar to that of Case I, and with identical results, first confidence and later ability, both following hard after physical tone.

Three times after I thought him safe he came back to me with the statement that he had lost all his gain. A week of the same rigid discipline started him on his way again each time, and when I now see him, as I often do, he can laugh about his nightmare, feeling safe that he is master of himself and no longer in dread.

Case IV, a man in his thirty-ninth year, furnished an example of sexual neurasthenia of such an aggravated type that he seemed hopeless not only to himself, but to me. While not insane in all that the word implies, he was thoroughly insane on the subject of sexual license. He looked on woman as an animal made simply for the sexual relief of man, and had practised this doctrine during several years to the extent of a number of excesses daily, both by masturbation and illicit intercourse, interspersed with natural intercourse with his wife on not infrequent occasions. He did not boast of this record, but he was in no way ashamed of it. As a curious paradox, he made it very plain that he desired to be freed from the belief that sexual excitement was the only enjoyment of value in life, also his determination to find a physician who would "not simply absorb his few remaining dollars," but in return therefor inform him to his satisfaction whether he could become like other men (in sexual matters), or whether he must be looked on as a shame and a reproach to the end of his days. He recognized the attitude of the world toward his idiosyncrasy, and, for the sake of public opinion merely, desired to become other than his perfectly satisfied and beatified sexual self.

He had always been well as a child until he fell "straddle" and injured himself. A little later he began to masturbate, and continued this practice two or three times daily. Then he was advised by a physician to adopt illicit intercourse. He contracted gonorrhœa, and during same had a swollen, painful knee. Had no venereal infection since, but had, and up to the time of my examination on June 15, 1905, still continued to have a constant erotic desire. Would have intercourse with four women in one night, and yet was not sexually quieted. Beginning to feel weak in the loins. Pains in joints, and all muscles tired. When he had typical seminal discharge, said that there was a great quantity of semen and also a cylinder or rod of crystal, gelatin-like material. Had been to prominent specialists in New York and Baltimore, and was invariably told that he had better let well enough alone, and that they could do nothing for him.

I found him in pain all over his body. Constant smarting on

micturition. Fulness in the prostatic region. No urethral discharge. Weak, and too flaccid in mind and body to leave the office when he had no more to say and I had opened the door for him. Seemed stupid and as if under the influence of a drug.

His physical examination was absolutely negative, apart from his circulatory apparatus. His hands were cold and cyanotic, and accentuated second aortic and pulmonic sounds accompanied a feeble cardiac action. The urethra admitted easily a No. 30 French sound. There was induration of the epididymus on both sides.

This patient also was placed under strict supervision and his day mapped out for him as far as possible. At my request, Dr. Ziegler cauterized the erectile tissue in both nasal passages. Only a part of the regulations were ever carried out by the patient, but enough was done to enable him to gain a start toward mental health at least. He was able to return to his work as a druggist, has regained a considerable amount of physical vigor, pretends at least to respect the rights of women, and is restraining the tendency to sexual delirium to some extent. He has proved to himself and to me that he can finish the work as soon as he will altogether do away with the daily sexual excitement. Whether he has gone too far in moral depravity for a cure on the simple basis of physical improvement is still only a matter of conjecture. At present the least one can say is, that his marked neurasthenia has disappeared, and that he is within sight of healthy manhood. Recently I learned that he was "better than he had ever expected to be, but not altogether there yet."

The narration of these cases speaks for itself, and little comment need be made. My object, fully explained to each patient, was to win his or her personal confidence; then to educate the physical body to do more than it had ever done in the way of attaining perfect tone, feeling certain that mind and nervous system would follow the body in regaining control and balance. I fed each to the limit at regular intervals, but made sure that every gram of food was burned up by exercise in the fresh air. As imperative as any one measure was the thorough, always artificial morning evacuation of the digestive tract. Physical tire was accomplished morning and evening, and real tire, never exhaustion, marked the limit of this feature of the program. As the muscles grew hard and the "second wind" began to appear, the depression and the neurasthenia seemed to lessen, until, as I have shown, the patient became convinced of the improvement and the possibility of cure. This self-confidence in a real, even if only a minimal, gain appeared in each case to be the beginning of the actual advance. This point won, the patient would begin to shoulder his own load, and the task become an easy one for me.

It may be objected that not every physician can afford the time for the handling of such a case. I certainly could not, and many a time wished that the patient belonged to someone else. I have none the

less accepted four such in a year's time, each reaching me as the outcome of the one preceding. I do not believe a physician, with the knowledge that he can cure, has the moral right to refuse. The patient must be made to pay for the time and for the cure, and the handling of such a case deserves a large fee. The great satisfaction of seeing the recovery of a physical and mental degenerate pronounced hopeless by doctors and friends alike is spur enough for any man, and may act more forcibly even than the prospect of filling the exchequer. No class of cases will give such a moral return.

Each of the cases cited had been treated before coming to me according to the regulation plan, rested, electrified, massaged, and overfed, and each was nearing the borderline between neurasthenia and confirmed insanity. In this class of cases internists and neurologists teach that we must not coerce the patient. One distinguished regius professor says that "a neurasthenic is usually made worse by a determined effort to fight against the disability," as contrasted with hysteria, in which such efforts are beneficial. The great majority of the students of the nervous specialties sympathize with this view. At a meeting of surgeons and gynecologists, held about a year ago, into which I strayed as a lamb among wolves, I heard a discussion of the subject, "Neurasthenia Complicating Gynecological Conditions." The entire trend (aside from the question of operating or not operating, with regard to which there were as many opinions as gynecologists present) was in the line of emphasizing the need of rest and overfeeding, in the vain hope of cure. One daring soul scandalized the meeting by suggesting the "horsewhip and forcible propulsion into the open air" for every neurasthenic woman. Pandemonium ensued as the outraged exponents of the rest cure wrestled for an opportunity to reply. None the less, this same physician and gynecologist (for by his remarks he proved himself to be both) was asserting in an overstrenuous way a fact which he had tested in actual cases, in which the method had brought him success where others had failed. The horsewhip was, of course, a figure. The idea was as sane as the result was perfect, and I wished for the opportunity to say that I had already learned that the principle was well grounded on fact and reason. Only the consternation of the meeting and the sudden adjournment prevented the raising of a purely medical voice to endorse and reassert the claim.

This principle outlines and determines pathogenesis and cure. Call neurasthenia what one will, or call what one will neurasthenia, the fact remains that it is not even a complete symptom complex, merely a portion of one, that is founded essentially upon a lowered nutrition of not only the nervous system, but of one and all of the tissues and systems of the body, the circulatory system, the bony system, the muscular system, the nervous system *also*, and above all upon altered and diminished food properties of the blood and lymph. The demonstration of the truth of this assertion can be

accomplished in any case that has not passed over the boundary between neurasthenia so-called and genuine insanity, and even in the early stages of the latter, as Case I would appear to show. The application of the truth requires personality and patience.

Reasoning backward, it would seem more and more probable, if normal conditions and health can be regained by the employment of active hygiene, embracing every measure possibly included in the term, and by hygiene administered against the patient's desire and by muscular force when necessary; if, I say, this be true, and I believe it to be a fundamental truth, then it would seem fair to conclude that neurasthenia is a misnomer and "hygiene hunger" the proper term. In one nerve exhaustion, in another trauma, in the next sexual excess, in a fourth that auto-intoxication peculiar to the disposition which Shakespeare characterizes when he speaks of those whose "fat blood slips lazily along their veins," in a sixth or seventh malaria or chlorosis, or overexertion of mind or body during rapid growth and development—any of these may underlie and cause, if you please, the symptom-complex that we have been content to denominate neurasthenia. Rest one, exercise another to the limit, feed those who need food, and starve the overgreedy; in every case provide a change of daily *regime*, overdose with clean water and clean air inside and out; and the time will arrive for everyone in which graduated exercise in the open air to the point of physical tire will begin to be possible and will serve as the road to health of mind and body.

Perhaps in the results that shall be obtained the physician will enjoy a renewed confidence in the justification of his existence, while the surgeon will sadly witness the reclaim of a wide range of purely medical conditions which he had dreamed might become his eminent domain.

NERVOUS MANIFESTATIONS OF ARTERIOSCLEROSIS.

By Alfred Stengel, M.D.,
PROFESSOR OF CLINICAL MEDICINE IN THE UNIVERSITY OF PENNSYLVANIA, PHILADELPHIA.

Various nervous symptoms may be met with in cases of arteriosclerosis, some of them being certainly the result of the vascular disease, while others are due to associated organic diseases. It must be recalled that persons suffering from arteriosclerosis usually have some form of structural disease affecting the kidneys, heart, brain, or other organs, or several of these at once, and it is important to distinguish the symptoms caused by such associated conditions from those which are properly attributable to the arteriosclerosis as such. In a certain sense the nervous manifestations resulting

from secondary organic diseases are, of course, assignable to the vascular disease that caused the organic trouble; but it is necessary to differentiate as far as may be possible between symptoms that result directly from the arteriosclerosis and those which have some intermediate organic derangement for their cause. More especially is it necessary to avoid the error, perhaps a little too likely to become prevalent, of attributing to arteriosclerosis, various symptoms that arise as a result of purely accidental organic diseases associated with the vascular trouble but not essentially due to it. The same difficulty occurs here as has happened in the past in the cases of such general conditions as neurasthenia, hysteria, anemia, etc. It is easy to acquire the habit of regarding all sorts of symptoms as the result of such conditions and of overlooking associated diseases. The danger is even greater in the case of arteriosclerosis, which is so nearly universal among the aged that the indolent diagnostician may readily fall into the way of attributing all of the generalized and more or less obscure conditions of senility and even of the presenile period to arteriosclerosis. For these reasons I shall take pains in the following discussion to point out, first, the certain results of vascular occlusion or disease, and, second, the symptoms associated with cases of arteriosclerosis that may be fairly attributable to that condition by reason of their analogy with the symptoms included in the first group and by the exclusion of other probable causes. Increase of knowledge may hereafter establish more accurate methods of determining the relationship of certain symptoms to disease of the bloodvessels and their occlusion, but for the present we must rely upon the plan suggested.

Symptoms Associated with Obstruction of Peripheral Vessels. The sudden occlusion or obstruction of one of the larger peripheral arteries is attended with immediate and usually quite characteristic symptoms. This may be observed when a larger artery is compressed with the fingers or a tourniquet, or when obstruction is caused by a large embolus from the heart or aorta There is sudden pain, often excessively violent in character, and generally loss of power in the parts supplied by the obstructed vessel. The pain may subside in a short time, to be renewed with secondary embolisms farther toward the periphery, or with increase of the direct compression; but later the violence of the pain is lessened, and nstead of intolerable suffering a more continuous aching follows or the patient complains of darting pains of relatively moderate intensity extending from the place of obstruction to the extremity of the affected member. The loss of power is rarely complete and becomes less marked after the initial violence of the attack has subsided. In some instances, however, the paralysis is absolute. Thus, in cases of total obstruction of the abdominal aorta by an embolus there may be sudden and complete paraplegia, besides intense pains in the legs of the character just described. In addition

to the two predominating symptoms, pain and loss of power, there are a number of others of a less conspicuous kind. Among these are pallor, coldness (objective and sometimes subjective), tingling or numbness, weakness or complete cessation of the pulses in the peripheral vessels, occasionally violent cramps of muscles, and sometimes lividity or edema. The tendency to cramps or muscular spasm was illustrated by the violent intestinal spasms produced in Thoma's experimental compression of the abdominal aorta. The other symptoms, more or less pronounced in severity, have been repeatedly caused by experimental compression of peripheral vessels and by embolism. Eventually the result of complete occlusion of a large artery is recovery by establishment of a collateral circulation or gangrene.

The following cases illustrate the direct association of pain, loss of power, etc., with occlusion of the main artery of a limb:

J. W., aged seventy years, had advanced general arteriosclerosis and myocarditis. He had two attacks of embolism, or more likely cerebral hemorrhage, each, rather remarkably, affecting the cuneus region. After the first there was hemianopsia, after the second nearly complete blindness. Finally, in June, 1907, there occurred a sudden embolic occlusion of the right external iliac or femoral artery, attended with such intense pain that the patient, though semi-unconscious, cried out in agony, and could be only partially relieved by large doses of morphine. The right leg became motionless at once, and subsequently recovered very little power. The posterior tibial and dorsalis pedis pulses could not be felt; the feet and later the whole leg grew pallid and cold. Two days later a similar attack occurred in the left leg and caused paralysis of the left leg, almost completing a paraplegia. Fortunately the patient did not long survive the development of these intolerable conditions, for the pain, though less marked than in the beginning, did not wholly subside, and every attempt to move the legs caused intense suffering and spasmodic contraction of the muscles. There were numbness and anesthesia of the skin, and before death necrosis of the heels and toes had begun.

A. V., aged fifty years, had an embolic obstruction of the femoral artery while walking. There was sudden pain in the back of the thigh, and the patient cried out, thinking that someone had struck him across the thigh with a stout cane. He turned round to see who had done so, when the power in the leg failed and he fell to the ground. This case is of interest because of the character of the pain complained of. In several instances within my knowledge the patient has expressed the same feeling of having been struck.

Painful Sensations Preceding Senile and Diabetic Gangrene. In these conditions vascular obstruction is less immediate and less complete than in the group just described, but it is unnecessary to offer proof of the well-established fact that the

gangrene of diabetics and senile arteriosclerotics is preceded by gradually increasing obstruction of the arteries. Neither is it necessary to describe in this place the various symptoms, such as coldness, numbness, tingling, darting pains, and finally the intolerable suffering that accompany the conditions. It is, however, important to consider whether these various symptoms are directly attributable to the vascular obstruction or rather to some associated condition. Kussmaul and later Joffroy and Achard have described cases of neuritis which they regarded as resulting from arteriosclerosis. While this possibility is less applicable to the suddenly developed pains attending the onset of senile and diabetic gangrene than to the more gradual conditions to be described in the next group, it may be mentioned here as a suggested explanation of certain painful conditions associated with arteriosclerotic occlusion of the circulation In view, however, of the sudden intense pain of embolic or experimental obstruction, and of the continuing darting pains following the more severe onset, it may be doubted whether the intervention of a neuritis is a frequent, not to mention a necessary, condition.

In the same group as the cases of gangrene may be placed cases of intense cardiac pain due to occlusions of the coronary arteries. It is a well-known fact that in many cases of angina pectoris embolic or thrombotic occlusions of the coronary arteries and degenerative lesions of the myocardium are encountered, and it has been believed by some that the attacks themselves may be the immediate result of such sudden occlusions. In proof of this view cases have been reported in which after a very severe attack of angina leading to sudden death recent embolism or rapidly developed thrombosis of the coronary vessels has been discovered. It is not my intention here to suggest that such vascular occlusion explains all cases of angina pectoris, but it seems fairly certain that some of the cases of intense cardiac pain leading to a fatal termination have this causation. It may be well to recall in the same connection the intense pain sometimes met with in the back in cases of renal embolism and the similar pains found in the region of the spleen upon the development of a sudden splenic infarction.

Pains and other Nervous Symptoms in the Extremities less Certainly Attributable to Arteriosclerosis. A variety of nervous symptoms, including numbness, tingling, a sense of coldness or of heat or burning, and other forms of paresthesia (acroparesthesia), and sometimes moderate or severe pain, together with a sense of stiffness, and perhaps actual stiffness or weakness, occur in persons of advancing years with more or less arteriosclerosis. These symptoms more frequently affect the legs than the arms, although the paresthesia is not infrequent in the hands. The severity of the manifestations may have a direct relation to the degree of arteriosclerosis, and may increase in direct proportion with the advance of that disease. In other cases it may be observed

that the symptoms increase and decrease as the condition of the heart suffices or fails to maintain the circulation in the sclerotic vascular system. As patients presenting these symptoms usually have other disorders in addition to arteriosclerosis, it may sometimes be doubted whether the nervous manifestations referred to are the result of the disease of the bloodvessels or of other (associated) conditions. The fact that the further progress of such cases shows only an increase in arteriosclerosis and its undoubted consequences, and not more pronounced local or general manifestations of other diseases, is rather convincing that the symptoms may be properly attributed to the vascular disease. Two cases of this sort may be very briefly cited:

J. R., aged seventy-two years, a highly arteriosclerotic man with associated cardiac hypertrophy, has suffered for some time with what he calls neuritis in his legs. There is tingling, burning, and pain in both legs, but principally in the right, from the knees to the ends of the toes. The pains are indefinite in location and cannot be increased by pressure along any of the nerve trunks. There is general weakness of the legs, but no definite palsy. The feet are cold, and at times become livid in spots. When his circulation is improved by the use of digitalis, strophanthus, and glonoin the pains decrease and in general his suffering is directly proportioned to his condition and especially the state of his circulation.

Mrs. R. S., aged sixty years, is markedly arteriosclerotic and has some gouty change in the joints of the hands. For several years she has complained of constant numbness and painful tingling in the fingers. To a less extent the feet have been similarly affected. There have never been acute gouty attacks. She has had no definite indications of neuritis.

In both of these cases the question may be properly raised whether or not the symptoms are the result of neuritis. The possible occurrence of an arteriosclerotic form of neuritis has already been alluded to, while in the second of the two cited cases another possibility, that of gouty neuritis, presents itself. In the first case the intensity of the symptoms has been so directly proportioned to the adequacy or inadequacy of the circulation that there has seemed little doubt about the directness of the association. In the other case, and this is but one of a number of similar type, one should perhaps be less certain of the relationship.

Allusion may now be made to a large group of more or less painful affections of the extremities associated with arterial disease in which the symptoms suggest the intervention of reflex vasomotor conditions between the arteriosclerosis and the acute manifestations. Among these affections are erythromelalgia, Raynaud's disease, "dead fingers," and intermittent claudication. All of these conditions occur in persons who have more or less decided arterial disease. In the first three the nature of the attacks and the paroxysmal

character of the vasomotor phenomena suggest that reflex nervous influences play an important part in the phenomena, but the association of marked arteriosclerosis and the constantly recurring circulatory disturbances suggest that the reflexes have their origin in the arterial disease. So far as intermittent claudication is concerned, this peculiar syndrome has been generally accepted as due to arteriosclerosis since Charcot's original communication and Erb's more extensive studies. The symptoms do not differ greatly from those first referred to in this group, but the pains, paresthesia, stiffness, cramps, and weakness are distinctly the result of effort. It has been assumed by some that these manifestations result directly from the inadequacy of the supply of blood, when the exercise of muscular effort taxes the circulation, while others have thought that vasomotor spasm results from the exertion and causes the symptoms.

It has been pointed out in proof of the first of these views that painful cardiac attacks associated with coronary disease lessen when the myocardium has grown considerably sclerotic and when in consequence the need of active circulation is less imperative than in the case of a more normal heart muscle. Erb and some more recent neurologists have maintained that a nervous element plays a part by exciting vasomotor spasm, and in proof of this cite the facts that coldness, pallor, and weakness of the pulses are frequent symptoms of the attacks, and that claudication is especially likely to affect arteriosclerotic persons who have a general neurasthenic condition as well. On the other hand, it is significant of the importance of the purely obstructive character of the vascular trouble that claudication has been universally recognized, since Charcot's description, as a forerunner of gangrene.

Dejerine, Sollier, and others have described cases of intermittent claudication in which the symptoms have been practically the same as those usually recognized, but with the distinctions that the signs of peripheral arteriosclerosis (coldness, weakness of pulse, etc.) have been wanting and the knee-jerks have been normal or absent during rest and excited after exertion. In these cases there was found arteriosclerosis of the spinal vessels, and Dejerine attributes the symptoms to anemia of the cord. The following case resembles Dejerine's variety in the behavior of the reflexes, but there was a very decided arteriosclerosis of the peripheral vessels:

L. H., aged fifty-three years, height six feet, first consulted me about eight years ago, when he had chronic pharyngitis and beginning deafness which was found to be due to middle ear disease. Even at that date he complained of a peculiar form of weakness in the legs after exertion. He was admitted to the University Hospital seven years later with more marked symptoms, which then took the form of rather distinct claudication. After every exertion he suffered with weakness, cramps, and pains in the legs, and his general condition was one of increasing debility. He had arteriosclerosis of a decided

grade involving the arteries in a uniform degree, and there was also distinct sclerosis of the peripheral veins. His station was slightly ataxic and the gait was somewhat shuffling, but after exertion, as in walking, he became notably weak in his legs, so that he could scarcely stand erect, and he complained of a sense of stiffness in his muscles. There were constant vague, indefinite pains in the legs, but no alteration in thermal or tactile sensation. The knee-jerks were usually absent, even on reinforcement, but after exertion or when under slight excitement the patellar reflex was present and sometimes actually exaggerated. He remained under observation for several months, growing more feeble as time went on, and finally became bed-ridden. His heart, which was a little hypertrophied and evidently deficient in power, failed, and finally, after a fall, he developed gangrene of one arm and died. The symptoms were those of intermittent claudication excited by exertion, but there was the possibility of a central (spinal) lesion suggested by the usual absence of patellar reflexes and by a tendency to vague sensory disturbances affecting the body in the region of the hips. My colleague, Dr. Spiller, inclined to regard the symptoms as sufficient to suggest a spinal lesion, but my own observations led me to believe that the condition was mainly, if not wholly, peripheral. We both agreed that the arteriosclerosis, whether operative peripherally or partly centrally as well, was the fundamental cause of the peculiar nervous manifestations in the legs.

In some cases the muscular stiffness and pain occur under precisely opposite conditions. In these instances, after sitting or otherwise resting, the patient finds, on attempting to rise to his feet or to walk, that the muscles have become stiff and painful and exertion is attended with more or less suffering. While in minor grades a common symptom in old people, this association occasionally reaches such a marked degree that it constitutes a clinical condition of much importance.

The diagnosis of this peripheral condition is sometimes extremely difficult, particularly in instances in which pains radiating through the limb suggest the existence of a neuritis. A number of such that have come under my observation have been so regarded. Among the distinctions which have impressed me as important are the absence of tenderness along the course of the nerves, the absence of anesthesia, and the presence and more or less proportionate grade of arteriosclerosis associated with the conditions.

Abdominal Pains in Association with Arteriosclerosis. Sudden obstruction of the abdominal aorta by a large embolus from the heart is known to produce intense pain; aneurysms of the abdominal aorta also occasion marked and often excessive pain; but there are conditions in which less serious disease of the abdominal aorta or other abdominal arteries may occasion painful conditions in the abdomen. It is not, I think, sufficiently recognized that a tortuous

sclerotic abdominal aorta or a simple pulsating abdominal aorta when slightly sclerosed may occasion intense paroxysms of pain. Some of the cases of continuous backache in old people have impressed me as belonging to this group. In these it is difficult to prove the cause of the pain, but in some others intense tenderness of the violently throbbing aorta in an emaciated person in whom the vessel can be palpated indicates the direct relationship between the vascular trouble and the clinical condition Furthermore, the association of pain with atheroma of the thoracic aorta furnishes an analogy that is of some significance.

Pains in Arteriosclerosis of the Thoracic Aorta. Not rarely in individuals with marked sclerosis of the arch of the aorta painful paroxysms occur upon slight exertion. In some instances these have the definite paroxysmal character of angina pectoris, even though the coronary vessels have not been involved Usually, however, the pain is more diffuse, extending almost equally to the right as well as to the left shoulder or arm, and the relation of the attack to muscular effort is a closer one than in angina from disease of the coronary vessels. It has been suggested that sensory end-organs (Pacinian corpuscles) in the wall of the aorta explain the tendency to these phenomena.

Cerebral Manifestations of Arteriosclerosis. The direct relation of arteriosclerosis of the cerebral vessels to cerebral hemorrhage and thrombosis needs no discussion, but it may be well to consider here the possibility that many rather indefinite cerebral manifestations in persons suffering from arteriosclerosis may be the result of (partial not completely obstructive) thrombosis of larger cerebral vessels or of complete thrombosis of finer branches. Lesions of this sort are apt to be overlooked even by the pathologist unless his attention is directed especially to this point. The studies of MacCallum have shown how hyaline thromboses of the smaller cerebral vessels may occasion marked cerebral symptoms in malaria, and similar lesions not infrequently occur in arteriosclerosis. Partial thromboses of the larger cerebral vessels are frequently met with, indeed are rarely completely wanting, in cases of extensive arteriosclerosis of the circle of Willis and of the other cerebral arteries. These thrombi, though not completely obstructive, cause a rather rapid encroachment on the lumen of the vessels, and thus interfere with the circulation in a manner more abrupt and violent than does the narrowing of the lumen that results from increase of the arterial disease itself. It is not unlikely, then, that the symptoms usually attributed to obstruction of the circulation by increasing arteriosclerosis are often the result of such thrombosis. However this may be, the more important fact to establish is that certain cerebral symptoms suggestive of other conditions may be due to arteriosclerosis with or without partial thrombosis.

The influence of obstruction of the cerebral circulation in the

development of symptoms is shown by the unequivocal results of complete thrombosis of large cerebral arteries, but even more directly by experimental studies, to which reference may now be made.

EXPERIMENTAL AND PATHOLOGICAL EVIDENCE OF THE INFLUENCE OF OBSTRUCTION OF THE CEREBRAL CIRCULATION IN THE DEVELOPMENT OF CEREBRAL SYMPTOMS. From the days of Avicenna, who caused loss of motion and sensation in animals by ligation of the carotid arteries, to the present time a long line of physiological experimenters have described a group of cerebral symptoms that could be caused by compression or ligature of the carotid vessels. Miller caused, in each of eighteen experiments, disturbed breathing and heart action, depression of temperature, sleepiness, vertigo, blindness, strabismus, spasms, and convulsions. Kussmaul and Tenner, in a more elaborate investigation, confirmed these findings and add results, exactly like those obtained in animals, which they obtained in human beings. They quote the results attained by a number of previous investigators, all of whom caused marked symptoms falling short of actual convulsions, and then cite their own experiments, in which convulsions were readily produced in six rather weak persons.

Naunyn was the first to call attention to the clinical occurrence of convulsions in persons suffering from cerebral arteriosclerosis, and his pupil Lucas[1] collected from the literature seven very striking cases in which convulsions (preceded by less severe nervous manifestations like those mentioned above) occurred in persons of middle or advanced age as the result of occlusion of the carotid arteries by thrombosis or compression by aneurysms and tumors. A study of the history and pathological conditions in these cases leaves little room for doubt that the cerebral symptoms were the direct result of the obstructed circulation. Lucas then reports two cases under the care of Naunyn in which elderly individuals with marked arteriosclerosis suffered from attacks of dizziness, headache, twitching of muscles, and great weakness. In one of the cases compression of the carotid arteries caused the rapid development of an attack in which the symptoms just mentioned, as well as temporary unconsciousness, occurred. The conclusions reached by Naunyn that these epileptiform seizures resulted from the conditions of the cerebral vessels appears to me entirely warranted.

Several cases of this sort have come under my observation, of which the following merit mention:

Mrs. W., aged seventy-eight years, has been under my observation for several years past. She has markedly sclerosed vessels and some hypertrophy of the heart. The kidneys seem reasonably normal.

[1] Inaug. Diss., Strassburg, 1894.

There are occasionally a trace of albumin and a few hyaline casts, but the conditions do not appear abnormal for one of her years. She has had a cataract in both eyes, one of which was operated upon with entire success three years ago. When she first came under my observation, three years ago, I was informed that for some little time past she had had attacks of peculiar character, often at night and sometimes also during the day. These had been regarded as petit mal. They consisted of momentary loss of consciousness or bewilderment, followed by slight clonic convulsions affecting the arms and legs and not beginning in any particular member, so far as could be discovered, and ending with a period of mental confusion and aphasia lasting from a few minutes to an hour, and ending in a deep sleep from which she awoke to her previous condition. Such attacks had occurred with some regularity for a year or two, when she had during the summer a seizure which appears to me to have been cerebral embolism or thrombosis, and left her with moderate hemiplegia. When I saw her in the following autumn the palsy had to a large extent disappeared. She has since had a number of attacks of the same character. Like the earlier ones, these involve no special part, being quite as likely to occur on the well side as on that which is partly paralyzed.

Mr. A. J. O., aged fifty-five years, had begun to suffer with circulatory disturbances, on account of which he first consulted me three or four years before his death I found an advancing arteriosclerosis, which steadily progressed up to the time of death. About two years before his death, when he was in rather good condition, he was seized with a sudden convulsion while playing at golf and was carried home. I found a slight right-sided hemiplegia, involving the face and arm, which cleared up almost completely within six or eight hours The upper arm alone seemed involved, the power in the fingers and the forearm being more or less completely preserved. After a few days he had no evidence of weakness in the right side. During the following summer he had two convulsions while in Europe, and there consulted Marie and other neurologists, all of whom agreed in regarding the convulsions as "functional." After his return to America several other convulsions occurred at intervals of a few months. There was no specific history, and up to the time of his first attack he had never had a lasting albuminuria, though he once or twice had a faint trace of albumin in his urine. After the onset of the paroxysms his general health grew worse and his circulation steadily grew weaker. Toward the end of his life he developed evidences of renal disease, which impressed me as being directly the result of the failing circulation. There was nothing in the paroxysms at any time suggestive of a uremic condition, and after the original one the recovery from the paroxysms was almost immediate, the whole seizure lasting little more than five to ten minutes.

J. T., aged sixty-five years, a patient in the Philadelphia Hospital,

had extreme arteriosclerosis and an enlarged but weak heart. The peripheral circulation was very poor. Extremities were usually cold. The patient's general condition was one of marked enfeeblement. The kidneys apparently were not diseased; at most, some senile change could be recognized. Suddenly, without premonition, a convulsive seizure involving the muscles of the right side of the face and neck and of the deltoid and trapezius of the right side developed while I was examining the patient. It was difficult to determine whether there was complete loss of consciousness, on account of the patient's general state, but there was evidently at least a partial unconsciousness. After a duration of about five minutes the attack passed off and the patient regained his previous condition. Subsequently he improved somewhat under rest and care in the ward, and he was discharged from the Hospital.

These three instances represent definite convulsive attacks in arteriosclerotic patients without any other explanation of the seizures. In two of the cases there was very probably thrombosis in at least one of the attacks; but the other attacks seemed to occur without any of the usual evidences of complete occlusion by thrombosis or embolism. In the third case there was but one attack, and this was not discoverably due to thrombosis. In view of the experimental evidence before cited, it may be regarded as established that sudden interference with the circulation, whether due to thrombosis or embolism, or independent of these accidents, may account for seizures such as occurred in the three cases just described. In the cases in which thrombosis or embolism are absent weakness of heart action may be the cause of the suddenly developed inadequacy of the cerebral circulation, while in other cases vasomotor spasm may possibly occur. The last explanation may apply to the seizures attending paroxysms of Stokes-Adams disease.

Stupor and Coma Associated with Cerebral Arteriosclerosis. The cases included under this heading are a little less definitely ascribable to the influence of the arterial disease alone, for the reason that the symptoms are less distinctly paroxysmal, and therefore less certainly the result of a temporarily active cause, such as circulatory disturbance. Nevertheless, in view of the fact that both stupor and coma have been produced experimentally by compression of the carotid arteries, and that in some cases the stupor suddenly appears and as suddenly disappears, the connection of the attacks with circulatory disorder does not seem unlikely. If one studies the symptomatology of extreme senility, there will be found a constantly recurring picture of stuporous states alternating with periods of mental alertness often quite surprising. The aged patient without warning falls into a lethargic or semicomatose state, and may remain so for hours or even days, and not infrequently wakes from this condition suddenly and completely, only to relapse again and again. The cause of these attacks may doubtless be an

incomplete uremia in some cases, or other forms of toxemia, but the sudden relief of symptoms that so often occurs has convinced me that the attacks are more usually dependent upon the condition of the cerebral circulation.

Sometimes the attacks occur in persons who have not yet reached the period of advanced senility, and the attacks may be more lasting than those just referred to. In such cases a diagnosis of uremia is very likely to be made. Not a few of the cases of "uremia" occurring in such hospitals as the Philadelphia Hospital, where aged derelicts abound, are I think not actually instances of uremia, but rather cases of coma due to disturbed cerebral circulation the result of arteriosclerosis. One instance of this sort will suffice for illustration:

J. C. A., a man aged sixty years, was admitted to my ward at the Pennsylvania Hospital in complete coma. There was a high grade of arteriosclerosis and extremely feeble heart action. There was no albuminuria at this time nor subsequently while in my care. On two previous occasions he had been treated at the Pennsylvania and another hospital, and had been regarded as uremic. I was impressed with the intense weakness of his circulation and the extreme arterial disease, and advised against any depletive measures or other treatment such as is employed in uremia. Hypodermics of strychnine followed by administration of strophanthus and nitroglycerin by the mouth caused rapid clearing of the stupor in direct proportion with improvement in his peripheral circulation, and twenty-four hours after admission he sat up in bed, took his food, and was generally quite decidedly clearer. Subsequently he lapsed somewhat, and his mental condition never wholly cleared up. A month later he was transferred to the Philadelphia Hospital, where his condition became less satisfactory, being one of extreme prostration and partial dementia. He was not easily manageable in the medical wards, and was transferred to the Insane Department, where he subsequently died without further developments. The records of his two earlier attacks are very fragmentary, not even the urinary examination being preserved. The diagnosis of uremia appears to have been made because the patient was comatose. In the last attack, which never cleared entirely, the duration was sufficient to have furnished some definite evidence of renal disease and uremia, had either been present, but repeated examinations of the urine failed to show any such evidence.

Vertigo, Temporary Aphasia, Ocular Disturbance, and Tinnitus with Cerebral Arteriosclerosis. All of these symptoms will be recognized as occurring in the group of conditions caused by compression of the carotid arteries and also among the manifestations of gross cerebral thrombosis. When one or the other occurs as a more or less isolated symptom in a case of arteriosclerosis, one hesitates to regard it as due to this cause alone, and very properly inclines to think it a part of some more definite focal, cerebral,

or visceral condition not yet fully developed. In many instances further symptoms may occur, and a cardiac, renal, gastric, aural, or local cerebral cause may be recognized. Sometimes, however, such symptoms recur repeatedly and no further developments take place until perhaps with increasing cerebral sclerosis more distinct results follow.

PSYCHIC MANIFESTATIONS OF CEREBRAL ARTERIOSCLEROSIS. Alienists have recently taken into account far more than formerly the importance of the circulatory conditions in the brain in the development of psychoses. Barret[2] has published a study of the subject, and quotes largely from Alzheimer and Binzwanger, both of whom have contributed notably to it. Among the distinctive types of mental disease in which arteriosclerosis is recognized as an important pathological lesion are mentioned general paralysis, arteriosclerotic dementia, and, less certainly, senile dementia. Among the special symptoms in the different groups are mental fatigue, headaches, dizzy attacks, memory weakness, psychical phenomena with progressive dementia, fainting, apoplectiform seizures, and epileptiform convulsions. Aphasia, periods of excitement, and mental confusion are characteristic of some. In Barret's group of cases the loss of retentive memory was among the earliest symptoms. Later, inclination to fabulate, loss of judgment, disorientation, narrowing of the external interests, episodes of confusion and hallucinatory delirium, etc., followed more or less quickly. These briefly cited references indicate the kind and variety of symptoms as they present themselves to the alienist. The general clinician will find among them the extremes of many of the isolated symptoms presented by senile or even presenile arteriosclerotics who happily never advance to these unfortunate grades of cerebral disease.

ARTERIOSCLEROSIS IN THE YOUNG.

BY F. FREMONT-SMITH, A.B., M.D.,

ASSISTANT PROFESSOR OF PEDIATRICS IN THE GEORGE WASHINGTON UNIVERSITY; ASSISTANT PEDIATRIST TO THE UNIVERSITY HOSPITAL; ATTENDING PHYSICIAN TO THE HOSPITAL FOR FOUNDLINGS, WASHINGTON, D.C.

IN 1890 I attended, at St. Augustine, a male mulatto, aged thirty-two years, who was suffering from obliterative endarteritis with gangrene of the toes, requiring amputation. His skeletal arteries were sclerosed and beaded. He gave a history of luetic infection in his eighteenth year. As to other infections I am not able to speak.

During the period of service on this man my attention was drawn

[2] Amer. Journal of Insanity, 1905, No. 1.

to his son, a boy aged twelve years, who by his pinched and haggard appearance, by his complexion, figure, and carriage, suggested an aged man rather than the freshness of youth. Examination revealed diffuse sclerosis in all palpable arteries, with calcification quite as advanced as that of his parent; the beading could not have been further exaggerated at any stage of life. Evidences of heart or kidney disease were absent. The boy was mentally bright, but physically stunted, frail, thin in flesh, and without muscular development. This case of general arteriosclerosis in a boy of twelve years was apparently due to congenital syphilis.

FREQUENCY. Isolated references to arteriosclerosis in the young appear in literature from early in the last century; the earliest with which I am acquainted being that of Portal,[1] in 1803, who states that "rarely the vessels of young persons become ossified; however, we find ossifications in the arteries of some children whose ossifications are not far advanced." Scarpa,[2] in 1819, writes: "Ossification of the arteries cannot be said to be proper to old age, since it is sometimes met with in patients who are not much advanced in life," and Hodgson,[3] in 1815, says his "friend Young possesses the temporal artery which he removed from an infant fifteen months old, in which the coats of the vessel are converted into a complete tube of calcareous matter."

Henoch regards pathological changes in the heart not more rare in children than in adults, but changes in the larger vessels uncommon. Virchow speaks of the importance of arterial degeneration in children, and Gerhardt considered it rare in children, largely because of lack of observation.

Seitz[4] in 148 cadavers observed at the Munich Pathological Institute found 10 cases between ten and twenty-nine years, and in over 2000 autopsies found numerous cases between the ages of seventeen and twenty-five years. Waldstein[5] in 102 examinations found 8 examples between seventeen and twenty years.

Schott[6] has found arteriosclerosis with aortic stenosis at the age of sixteen. Martin[7] has seen aortitis frequently after the first year, but never disease in the middle-size branches before the twentieth year.

Romberg[8] says that in Germany the disease augments with rapidity after the fifteenth year. In 1477 sections on all ages and conditions he found 2 instances between one and fourteen years, and 5.88 per cent. between fifteen and nineteen years with walls diffusely thickened; he calls attention to the remarkable thickening and stiffening which he has observed clincially, without nephritis or rise of blood

[1] Cours d'Anatomie Méd., 1803, iii, 133.
[2] On Aneurysm, Wishart's transl., 1819, p. 89.
[3] Diseases of Arteries, etc., 1815, p. 23.
[4] Verhandl. d. Gesell. f. Kinderh., 1896, xiii, 177.
[5] Cited by Seitz.
[6] Verhandl. des Kong. f. in. Med., 1904, p. 143.
[7] Bull. soc. anat. de Paris, 1826, ii, 17.
[8] Handb. d. prak. Med., Bd. i, p. 755; Verhandl. des Kong. f. in. Med., 1904, p. 60.

pressure in children twelve to sixteen years of age. Marchand,[9] Bäumler,[10] and Kaigi-Sawada[11] have lately referred to diffuse hypertrophy of the walls of the whole peripheral system without nephritis, in young persons. Roger,[12] in 98 cases of aortic aneurysm, found but 1 under twenty years, and of 59 abdominal aneurysms none under twenty years. Holmes[13] tabulated 13 instances of intracranial aneurysm in children, and Parker,[14] Crisp,[15] Jacobi,[16] and Keen[17] have cited numerous extracranial aneurysms in the young, a majority of which, however, on investigation are dependent upon trauma, infective embolism, or erosion by contiguity with abscess cavity. Camac,[18] from hospital records, concludes that "arterial disease in children under six years, even those who are victims of congenital syphilis, is practically unknown; in those from six to fifteen years it is rare," and, in the examination of records of 799 autopsies in children dying in the New York Foundling Hospital, finds no case of aneurysm between one and ten years. Camac, from 340 autopsy reports of aneurysm in the literature, finds in the first five years of life 2 cases; in the second five years, 3 cases, and in the second decade, 27 cases. Holt[19] has seen cerebral hemorrhage in a child of two months.

Not until the recent thorough studies of the minute pathology of arteriosclerosis by Ortner,[20] Flexner,[21] Thayer,[22] Symnitzky,[23] and Wiesel[24] has the frequency and import of arteriosclerosis in the young been realized. By their work light is thrown upon previously reported cases and the relation of the acute infections to arterial disease has been established. Thayer, in a study of 189 persons long recovered from typhoid fever, states that "between the ages of ten and fifty years, 48.3 per cent. of old typhoids showed palpable arteries, as compared with 17.5 per cent among ordinary healthy individuals." Symnitzky, in 138 autopsies on persons under twenty-five years, dying of various acute infections, found sclerotic changes in the aortic wall in 38, or 27.5 per cent. Excluding cases under two years, in which it did not appear in this series, his records show aortitis in 48 per cent. of cases examined. Wiesel, from 300 autopsies of the young dying at the height of various infections, records greater or less pathological processes in the arterial coats of nearly all cases.

ETIOLOGY. Osler states: "that heredity plays a most important role is shown in the cases in which arteriosclerosis sets in early in life in

[9] Verhandl. d. Kong. f. in. Med., 1904, pp. 23 and 48.
[10] Münch. med. Woch., 1898, v, 133.
[11] Deut. med. Woch., 1904, xxx, 425.
[12] Bull. soc. med. des hôp. de Paris, 1863, p. 499.
[13] Lancet, 1873, i, 236; System of Surgery, second edition, iii, p. 421.
[14] Trans. Med. Chir. Soc., London, lxvii, 51.
[15] Diseases of Bloodvessels, 1847, p. 75.
[16] Arch. Pediat., 1890, vii, 161.
[17] Med. News, 1887, li, 725.
[18] AMER. JOUR. MED. SCI., 1905, cxxix, 845.
[19] Dis. Inf. and Childhood, 1906, 800.
[20] Zeit. f. Heilk., 1905, vi, 121, 174, 183.
[21] See Thayer: New York State Jour. Med., 1903, iii, 21.
[22] AMER. JOUR. MED. SCI., March, 1904.
[23] Zeit. f. Heilk., 1903, xxiv, abth. f. Path. Anat., iv, p. 177.
[24] Zeit. f. Heilk., 1906, xxvii, 161.

individuals in whom none of the recognized etiological factors can be found." Seitz regards heredity and individual predisposition in the non-syphilitic important factors in childhood. Klebs[25] saw thin vessels in a child of thirty-two weeks. Balassa,[26] Gull,[27] and Webber[28] speak of congenital atrophy of the coats. Cruveilhier[29] described a case of aneurysm with congenital thinness of the media. Eppinger[30] reports 2 cases with anatomical wall deficiency; Dieulafoy,[31] a case of infantile cerebral hemorrhage with similar conditions. Brill and Libman[32] report a girl of fourteen years with marked family tendency to arteriosclerosis, with no history of congenital syphilis or acute infection, who died of hemiplegia. Autopsy revealed general arteriosclerosis with interstitial nephritis. The scleroses were especially located in the aorta, coronary and superior mesenteric arteries, with calcific deposits in the vessels of liver and kidneys, and here and there points of obliterative arteritis. All causes other than heredity appear to have been eliminated.

The role of congenital syphilis has apparently been somewhat overestimated in youthful cases by earlier writers who were not aware of the part which the acute infections play in the production of focal necroses, preparing the soil for future gross lesions of greater or less moment. It has frequently been accepted without question that luetic infection is the chief factor in the production of aneurysm; hence some interest attaches to the collection which I have gathered of 46 aneurysms, at or under twenty years, clearly to be attributed to local arteriosclerosis.

The histories of these precocious cases make mention of syphilis in 12 instances, it being negative 11 times and positive once. Among 144 individual reports of juvenile arteriosclerosis collected from earlier literature, nearly all with imperfect histories, I find reference in 55 instances to congenital syphilis; it appears as a positive cause in 10, and is negative in 45 records.

Sonnenberg[33] notes 2 fatal bleedings in congenital syphilitics, after ritual circumcision on the eighth day of life, in both of whom he found arteriosclerosis of the cut vessels. Hochsinger,[34] in dissections of livers of the congenitally syphilitic, found disease of the arterioles in 5 instances.

In Symnitzky's 38 young cases, syphilis is negative, and in Wiesel's 80 detailed cases of arteriosclerosis autopsied during the active stage of acute infections syphilis does not enter as a possible factor. In adult life, however, the causative ratio rises much higher. Chiari,[35] in the study of a large number of syphilitic infections shows that mesarteritis was present in one-half of the cases.

[25] Cited by Jacobi, Arch. Pediat., 1890, vii, 161.
[26] Cited by Jacobi, ibid.
[27] Cited by Jacobi, ibid.
[28] Cited by Jacobi, ibid.
[29] Anat. Path., liv, i, 15.
[30] Arch. f. klin. Chir., 1887, iv.
[31] Gaz. hebdom., 1887, xvi, xviii.
[32] Jour. Exper. Med., 1899, iv, 5.
[33] Verhandl. d. Gesellsch. f. Kinderh., 1896, xviii, 177.
[34] Ibid., p. 182.
[35] Verhandl. d. deut. Path. Gesellsch., 1899, ii.

Hoffbauer,[36] investigating nodular and diffuse arteriosclerosis of the tuberculous, says he "can find no pathological difference in the arterial wall between tuberculosis and nephritis" and remarks that "it is necessary for the future to give up the causal connection between blood pressure and arterial thickening." Remlinger,[37] 1905, reviewing Romberg's juvenile cases says: "Concerning the cause of so-called diffuse arteriosclerosis in the young nothing is known."

Camac, in extensive researches of hospital reports, attributes about 32 per cent. of adult aneurysms to syphilis; about 16 per cent. to tuberculosis. From his analysis of 3954 necropsies he concludes that aneurysm is three to four times as common in the colored as in the white race. From my group of non-luetic aneurysms I cull a few unique examples. Phänomenow[38] refers to an infant stillborn at seven months, with aneurysm of the abdominal aorta and local endarteritis, the abdominal circumference measuring 15¾ inches, producing dystocia. Martin saw aneurysm of the ductus arteriosus in an infant of one month. Roger made a section on a child of ten years, with negative history, barring suffocative and cyanotic seizures, revealing aneurysms of the transverse aorta. Eppinger reports a girl of ten years, without infection, with aneurysm of the right and left coronary and the intercostal arteries at their origin. Comby[39] speaks of a girl of fourteen years, who, after two attacks of acute articular rheumatism, died of aortic aneurysm.

I wish also to call attention briefly to a very few suggestive examples of apparently non-syphilitic arteriosclerosis in the young, from earlier literature. Durant[40] reports congenital arteriosclerosis in an infant of premature birth, who on the sixth day died of peritonitis incident to umbilical infection. The lesions were of a chronic character, being pronounced calcareous degeneration of the media of the aorta and pulmonary arteries. Henning[41] reports a case of congenital changes in the aorta and heart valves, in a fœtus whose mother, during pregnancy, had an attack of acute articular rheumatism. Haussman[42] described a case of fatal aortitis in a fœtus. Goodhart[43] refers to a male infant of two months, with congenital calcification uniformly distributed around the mitral orifice. Meigs[44] examined an infant of five months dying of marasmus, whose only pathological lesion was sclerosis in the left coronary artery, near its origin. Ballantyne[45] mentions great atheromatous changes in the aorta and pulmonary arteries in a fœtus of eight months. Fischel[46] had a case of endarteritis in a child of five months. Moutard-Martin[47] reports a

[36] Zeit. f. Heilk., 1906, xxvii, 161.
[37] Zur Statistik der Arteriosklerose, Marburg, 1905.
[38] Arch. f. Gynäk., 1881, xvii, 133. [39] Bull. de la Soc. pediat. de Paris, 1906, ii, 11.
[40] Bull de la Soc. anat. de Paris, 1899, lxxiv, 97
[41] Jahr. f. Kinderheilk., xxx. [42] Monatsch. f. Geburtskrank., 1869.
[43] Diseases of Children, 1894, p. 612.
[44] Trans. Col. Phys., Phila., 1889, 3 S., xi, 159.
[45] Manual Antenatal Path., Edinburgh, 1902.
[46] Biedert's Handb. d. Kinderheilk., 1902. [47] Bull. Soc. anat. de Paris, 1875, xii, 775.

child, without kidney involvement or luetic infection, dying of smallpox. The autopsy revealed aortic plaques and the aortic valves covered with calcific incrustations. Andral[48] found calcific plaques in the aorta of a girl of eight years, and Brooks[49] observed coronary sclerosis in a boy of fifteen years.

Realizing how few autopsies in children have included thorough investigation of the vascular system, it becomes apparent that my collection of 146 cases, comprising a careful review of the literature up to near the present time, must represent a very small minority of cases in which such lesions have actually occurred, and this is abundantly proved by examination of recent work.

Heart lesions associated with acute infections have received much attention in the past, but the arteries have been neglected.

In 1902 Flexner made an autopsy on a man from Dr. Osler's service, twenty-two years of age, dying on the ninth day of typhoid fever, from thrombosis in the left middle cerebral artery. I quote Flexner's pertinent record of sections through the cerebral vessels in this case: "These show evidence of a most extensive arteritis. In the less affected parts of the vessel wall the muscular coat takes on a very pale stain, while in many places the fibers, which seem swollen, are separated by vacuolic spaces. At some points these are so numerous that the tissue has an almost reticulated appearance, consisting of a loose, wavy, palely staining material in which traces of elastic tissue may still be seen, and containing numerous larger and smaller clear spaces. The muscle nuclei are in many instances swollen and deformed. The internal elastic membrane has in a great part disappeared. In many places the distinction between the individual coats of the artery is wholly lost, the entire wall being infiltrated with a mass of cells the nuclei of which are extensively fragmented." Flexner concludes: "When one considers the brief duration of the clinical symptoms, the character of the thrombi (of undoubted agglutinative origin), and the extent of the vascular changes, together with the fact that these changes are also visible in vessels in which no thrombus has occurred, it would seem clear that the arteritis was the earlier change." Thayer regards it "natural to suspect that they (arterial lesions) are a result of an acute localization of *Bacillus typhosus* or of some secondary infectious agent in the walls of the vessel." Thayer[50] conceives the role of the acute infections as important in the production of focal degenerations which constitute an important element in arteriosclerosis.

Among 52 autopsies observed by Thayer and Brush,[51] death being caused by typhoid fever, sclerotic changes were observed in the aortæ of 30 (fresh lesions in 21), while among 62 examinations of

[48] Précis d'Anat. Path., 1829, ii, 380.
[49] Amer. Jour. Med. Sci., 1906, cxxxi, 778; New York Med. Jour., October 27, 1906, p. 825.
[50] New York State Jour. of Med., 1903, iii, 21.
[51] Jour. Amer. Med. Assoc., 1904, xliii, 726.

the coronary arteries of subjects dead of typhoid fever "19 had definite sclerotic changes and in 4 more yellow opacities of the intima were observed." This thorough investigation of the vascular effects of typhoid fever was soon followed by the valuable paper of Symnitzky. Of his 38 subjects, dead from various acute infections, 24 were under twenty years of age, and I have selected this group for brief analysis. They comprise 4 cases of pneumonia, 3 of typhoid fever, 2 of tuberculosis, 2 of scarlatina, and 1 each of scarlet fever followed by nephritis, tuberculous meningitis, acute endocarditis, chronic endocarditis, typhoid fever complicated by pneumonia, cerebral sclerosis with epilepsy, tuberculosis with epilepsy, diphtheria complicated by measles and pneumonia, acute rheumatic arthritis, pyemia, chronic nephritis and peritonitis, in all of which the lesions noted were in the aorta, in 3 instances extending to its larger branches. None gave a history of syphilis, 1 of alcohol. In 9 the history was quite negative; in 15 there had been acute or chronic illness in earlier life, to which it would seem the findings might be attributed in about equal probability with the terminal malady. In 3 of Symnitzky's cases there was disappearance of the elastic elements with proliferation of the medial connective tissue; in 11 there was proliferation of the connective tissue and the elastica; in 2 only changes in the adventitia, being small round-cell infiltration around the vasa vasorum. In the same case he occasionally found different pictures of sclerosis in various stages. It is to be mentioned that among the 24 selected cases the heart was diseased eleven times, simple hypertrophy twice, hypertrophy with dilatation once, and valvulitis eight times, representing 45.9 per cent. with cardiac involvement.

The latest and most extensive investigation of the influence of acute infections is the work of Wiesel, published in July, 1906. This requires somewhat detailed study. The number of autopsies made was 300, being the product of three years of Kretz's service at the Franz Josef-Spital, Vienna. The 80 reported cases represent a highly refined study of the beginnings of arteriosclerosis. The subjects were young, many of them infants, and macroscopic and microscopic observations were taken upon central and peripheral vessels at the beginning or height of fatal illness from diphtheria, scarlatina, measles, pneumonia, influenza, sepsis and pyemia, osteomyelitis, suppurative otitis, typhoid fever, cerebrospinal meningitis, mushroom poisoning, and other conditions. Wiesel has furnished notes of 20 cases of diphtheria, 20 of scarlatina, and 40 of other infections, in all of which, without reference to the character of the infection, similar degenerative changes are described, modified only by the length of the infective influence.

Macroscopic changes appeared occasionally, usually between the sixth and the tenth day, as minute yellowish patches in the aorta, carotids, and coronaries, and in a few instances minute projections

of calcareous deposits were visible, which Wiesel regards as a postinfectious process initiating true arteriosclerosis. In the histological examinations remarkable microscopic degenerative changes were almost constant, not only in the large trunks, but in the end arteries and even in the intestinal vessels. Usually before the fifth day Wiesel states that serous infiltration of the vessel media occurs, vacuoles appear between muscle fibers, fibers are contracted and elastic lamellæ separated by a homogeneous substance which takes the stain badly, and within which appear occasional leukocytes. At this stage the elastic fibers are displaced, but no ruptures appear. The endothelium at this stage is unchanged. From the eighth to the tenth day occurs the pathological climax, rupture of elastic fibers and necrosis of the musculature. Occasionally the intima is involved. Changes are greater and earlier in the peripheral arteries. Wiesel admits uncertainty as to the ultimate fate of these acute vessel changes, but believes regenerative changes take place. In some instances a few weeks advanced, he observed new elastic fibers from the intact adventitia growing into the partially destroyed media. He reports a typhoid fever subject who, three months after recovery, died from another disease, in which new tissue growth appeared in the media of the aorta and some of its branches. In 4 cases of death about one year after recovery from diphtheria, the only abnormality consisted in unusual appearance of elastic fibers and frequent replacement of muscle elements of the media by fibrous tissue. Advanced medial necroses may continue progressively, involving the intima and developing postinfectious atheroma, and local and general arteriosclerosis, with their sequels.

There is a striking similarity between the changes in the media and such as are produced artificially by the subcutaneous or intravenous injection into rabbits of adrenalin and various other toxins. Pearce and Baldauf[52] have lately reported lesions by single injections of adrenalin.

Equally interesting are the sections of bloodvessels in persons dying from uncinariasis. Through the courtesy of Dr. Baily K. Ashford, whose work in Porto Rico is well known, I have been able to learn of his unpublished studies on the bloodvessels in this disease and to examine sections of arteries and of the liver, kidney, spleen, and skeletal vessels presenting characteristic diffuse fibroid degenerations of the media of the very young as well as middle-aged subjects. I myself have seen popliteal aneurysm in a case of uncinariasis and Claytor[53] reports cerebral hemorrhage from the same cause.

In the previously detailed cases there appears a remarkable uniformity in pathological changes in a great variety of conditions. Evidences of restitution of integrity were apparent in the cases of longer duration. How permanent the damage may be in patients

[52] Amer. Jour. Med. Sci., 1907, cxxxii, 737.
[53] Ibid., 1902, cxxiii, 10.

who survive the initial disease is not established; diffuse fibroid degeneration in the media would affect unfavorably the nutrition of the intima and lead to the early development of general arteriosclerosis or to atheromatous plaques and possibly aneurysm. The frequency of palpable arteries after typhoid fever, previously mentioned, would thus be explained. The findings of Flexner in typhoid fever, and of Wiesel in many infections, are practically identical and seem to point to a uniform primary medial degeneration in these diseases and in certain other intoxications not of bacterial origin.

The growth in knowledge of arteritis in the young, from the early gross observations of rare and accidental instances up to recent systematic and refined study, may, it seems, prove of distinct assistance in our comprehension of early developments in adult life. Whatever the arterial sequels of the acute infections may prove to be, their effect must be intensified by the commonly recognized causes, and these factors combined would develop early and abnormal expressions of degeneration, termed presenile, the primary etiology of some of which has never appeared entirely clear and satisfactory.

LACK OF GASTRIC MUCUS (AMYXORRHŒA GASTRICA) AND ITS RELATION TO HYPERACIDITY AND GASTRIC ULCER.

By J. Kaufmann, M.D.,
PHYSICIAN TO THE GERMAN HOSPITAL, NEW YORK.

Of late a number of articles have been published which deal with the physiological and pathological secretion of gastric mucus and have given a fresh impetus to the long-neglected study of these conditions. I wish to report some of my own observations on this subject which will show that the secretion of gastric mucus is a necessary function, and that lack of mucus leads to serious disturbances. For several years I have made notes on the amount of mucus found in stomach contents. Of the interesting results thereby obtained, I shall confine myself to describing a frequent finding, that is, a complete lack of mucus in the gastric contents, a condition which is pathological and which has not been described heretofore.

The reason that this condition has not been recognized is that, as a rule, the contents of a fasting stomach, gained by expression or lavage, are used for the clinical examination of mucus. In this way, however, we can only detect an abnormal increase of mucus. Although it seems that in the stomach mucus is constantly secreted to some extent, its secretion is principally connected with the digestive period. The wash water of a fasting normal stomach does not show any mucus or only small quantities. Whenever we find, in

the fasting stomach, such quantities of mucus as are easily accessible for examination, we are dealing with a pathological increase. Under these conditions it is obvious that we cannot expect to gain much information about a decrease or lack of gastric mucus by examining the fasting stomach. However, I could not fail to recognize this condition of lack of mucus when I began systematically to examine gastric contents for mucus after test meals. In doing so I easily became convinced that stomach contents under normal conditions show a moderate amount of mucus after meals and that lack of mucus must, therefore, be considered abnormal. I have examined gastric contents for mucus in several thousand cases, always proceeding in the same routine way. In each case the contents were examined, macroscopically and microscopically, immediately after their removal from the stomach, one hour after a test breakfast of tea and toast had been given. Without going into statistics, I wish to give some general results derived from these observations.

Recognition of Mucus. The presence of mucus is recognized by its most characteristic quality, its coherency. Such is the case with the moderate quantities of mucus which under normal conditions are found thoroughly mixed with the bread after a test breakfast. The bread more or less finely divided, according to the degree of mastication and the degree of digestion by the gastric juice, is held together by the mucus. In pouring the stomach contents from a glass to a filter, it flows out somewhat coherently. This coherency is more pronounced when the mucus is pathologically increased, and yet it is sufficiently distinct with normal quantities of mucus to make the latter clearly visible. When no mucus is present we miss this coherency of the bread mass; the bread particles are distinctly separated, both in cases in which the bread is divided into fine particles and in cases in which it is hardly changed, and is still present in larger pieces. The lack of mucus, however, is most obvious when we find the bread very finely divided and forming a flour-like layer. The absence of mucus in the latter cases is clearly demonstrated by the ease with which these fine bread particles move about, as also by the clear fluid which quickly forms as a separate layer on top of the bread. In cases in which a great deal of mucus is secreted, this separate layer of fluid shows a distinct, slimy character. The less mucus present, the more easily and the more quickly the fluid passes through the filter and the remaining bread mass on the filter shows distinctly, whether it is mixed with mucus or not.

The presence or absence of mucus should be corroborated by the microscopic findings, which are very characteristic. When gastric mucus is present, the different elements of the stomach contents, that is, starch globules, gluten, yeast bacteria, cells, etc., are bound together by the coherent mucus into smaller or larger clumps. The mucus is recognized by numerous myelin drops which are thoroughly mixed with the above-named elements. Even in places where these ele-

ments are more separate, numerous myelin drops are found and give the whole picture a blurred appearance. Under certain conditions the mucus appears fibrillar or in the form of spirals. When no mucus is present no myelin drops can be seen, the field is absolutely clear everywhere, and the different elements, such as starch globules, gluten, yeast, etc., not kept together by the binding mucus, appear singly and are each sharply outlined—a marked contrast to the picture first described. This characteristic picture of sharply outlined bodies in a clear field is most pronounced in cases of hyperacidity, in which the gluten of the bread has been dissolved and digested, and in which all the starch and yeast globules have thus been liberated. It does not, however, depend on the digestion of the gluten, for in cases of achylia gastrica the gluten itself appears sharply outlined in a clear field, provided no mucus is present.

I have tried to demonstrate the myelin drops more distinctly by the use of sudan, which stains them more or less red, according to the amount of fat which the myelin contains. However, the peculiar dull lustre of the unstained myelin is so characteristic that there is no advantage in staining with sudan. Much more characteristic pictures are obtained by staining the specimen with diluted Lugol's solution. The Lugol stains the starch blue, the yeast yellow, thus showing these bodies in sharp contrast to the rest of the specimen. It does not mix with mucus and, therefore, we find in specimens in which mucus is present only such starch globules stained blue that are free or on the edges of the mucus, while those that are incorporated in the mucus are left unstained. When no mucus is present, the Lugol reaches every single starch globule in the specimen. The distinct appearance of these deeply stained and sharply outlined bodies in a clear field gives a most typical picture, which in itself is characteristic of the absence of mucus. From the combined result of both macroscopic and microscopic examinations, we can thus easily determine the amount of gastric mucus present.[1] Although we have no quantitative method of measuring the amount, experience teaches us to estimate it and thus we find, under normal conditions, a moderate amount of gastric mucus in the breakfast. Under pathological conditions the mucus is either increased, decreased, or absent. The amount of mucus does not go hand in hand with the amount of gastric juice. In certain cases of achylia gastrica we see increased quantities of mucus and in others no mucus

[1] I wish to mention here, that this gastric mucus can be differentiated from mucus which originates from the upper air passages. Mucus which has been swallowed is never so thoroughly and evenly mixed with the stomach contents as the mucus secreted by the stomach and is, therefore as a rule, easily recognized as a foreign body and often identified microscopically by the finding of cells from the throat and pigmented alveolar epithelium, which it carries along. When epithelial cells are found in the gastric mucus they are of a different type (cylindrical); furthermore, they are usually found only in cases of gastritis together with leukocytes. In the gastric mucus which is secreted under normal conditions, as described above, I have rarely seen any cellular elements.

at all. On the other hand, although cases of hyperacidity as a rule show a lack of mucus, we observe cases of hyperacidity with increased mucus (gastritis acida). In fact we meet with various combinations of mucus and gastric juice. I shall not discuss these questions any further, but shall limit my remarks to the lack of mucus.

Lack of Mucus. In my examinations after a test breakfast, I have noted a complete lack of mucus in a great number of cases, it being more frequent than an increase. The lack of mucus may be due to different causes: there is either an insufficient secretion, a condition which could be named amyxorrhœa gastrica, or the secreted mucus is digested, or it is dissolved by the action of bacteria, as we see happen in cases of bronchoblenorrhœa. A certain amount of mucus is possibly digested by an active gastric juice. However, certain considerations speak against the probability, that this complete lack of mucus in the breakfast is entirely due to its being digested.[2] First among these is the fact, which I have just mentioned, that lack of mucus occurs with varying degrees of acidity and even in cases of achylia gastrica, in which the absence of gastric juice excludes mucus digestion, while on the other hand, an increase of mucus is found in certain cases of hyperacidity with a very active gastric juice (gastritis acida). Another argument is furnished by the following observation: In a number of cases of hyperacidity, which at first showed complete lack of mucus, I found at subsequent examinations, after treatment with silver nitrate, that distinct quantities of mucus were present while the acidity remained unchanged. Therefore, the lack of mucus before the treatment cannot be explained as being due to digestion, otherwise it would be difficult to understand why after the treatment with the same active gastric juice mucus should be present.

No matter what the cause of the lack of mucus, whether it is due to diminished secretion or whether it is dissolved and digested after secretion, I think we are justified in concluding that the lining of the stomach is not well covered with mucus when we find none in the gastric contents after a test breakfast. It is at once obvious what this means. The mucus is the protective agent of the gastric mucosa. In cases in which no gastric juice or gastric juice of low acidity is secreted, it may not be of great importance whether the mucosa is covered by a thick or a thin layer of mucus. This is altogether different in cases with an active gastric juice, especially

[2] I have said nothing about dissolved mucus, because we are only dealing with mucus which is visible as such both macroscopically and microscopically. Mucus which cannot be recognized as such does not act as mucus any more and, therefore, has lost its proper significance as a protective agent, which we shall see later is one of its chief functions. Furthermore, A. Schmidt (Volkmann's Vorträge, N. S., Nr. 202, p. 1131) has justly pointed out that mucus once dissolved in the stomach is readily digested and that the common tests for it, such as the acetic acid test, are unreliable.

when it is of high acidity, because it is the layer of mucus which protects the mucosa against the action of the acid secretion.

LACK OF MUCUS AND HYPERACIDITY. We are all familiar with the various subjective symptoms of gastric irritation (burning, gnawing sensation, more or less severe pains, etc.) and the manifold reflex symptoms which occur in patients suffering from hyperacidity. An analysis of a great many histories has convinced me that all these symptoms are most pronounced in patients whose stomach contents are found entirely free from mucus. That the lack of mucus actually plays a great role here became clear to me when I noted complete absence of mucus in some of those well-known cases which present all the gastric and reflex symptoms of so-called hyperacidity, whose stomach contents, however, showed no excess of acids, but normal or even subnormal figures of acidity. There was always some difficulty in explaining the occurrence of "hyperacidity symptoms" in cases in which there really was no hyperacidity. Most authors (Stockton,[3] Steele,[4] and others) maintain that in such cases a sensory neurosis is the underlying cause of the hyperesthesia of the gastric mucosa. Without underestimating the importance of a general neurosis in the development of painful sensations, I think we have a more satisfactory explanation in some of the cases, if we consider the lack of a sufficient cover of mucus as the principal cause which renders the gastric mucosa so sensitive to secretions of a high or even moderate degree of acidity. I can offer another observation to strengthen this opinion.

ACTION OF SILVER NITRATE ON THE SECRETION OF MUCUS. No treatment removes more quickly all the so-called hyperacidity symptoms than the application, by lavage, of solutions of silver nitrate. I can state this positively on the strength of an experience gained by the treatment of hundreds of cases. When after such treatment and after the patients had been perfectly free from all subjective symptoms the stomach contents were again examined, I have often been greatly surprised to find, instead of the expected lowering of the acidity, that the high figures of hyperacidity had remained unchanged. It has already been pointed out by Baibakoff[5] that the application of silver nitrate does not necessarily reduce the secretion of the gastric juice. Although I have observed in certain cases a decided lowering of the acidity after treatment with silver nitrate, such lowering was not the rule. I have seen more cases in which the acidity remained high; in fact, in some I found even a higher degree of acidity after the treatment than they had before the treatment. And yet these patients had been freed of their annoying symptoms by the use of silver nitrate and many of them had been promptly relieved from severe pains.

[3] Jour. Amer. Med. Assoc., January 11, 1903.
[4] Ibid., August 18, 1906.
[5] Archiv f. Verdauungskrankheiten, vol. xii, p. 54.

Such observations certainly prove that hyperacidity cannot be the only cause for the suffering of these patients. That, however, the lack of mucus plays a role here becomes plausible, when I report that I found in such cases with persistant hyperacidity distinct quantities of mucus in the stomach contents after the treatment with silver nitrate, while the examination made before the treatment had revealed no mucus at all. It was the appearance of mucus with an improved condition which first made it clear to me that the lack of mucus before the treatment was abnormal, and might account to some extent for the suffering.

The increased secretion of mucus by the use of silver nitrate is easily understood, when one reads the description of Pawlow's[6] experiments. Pawlow demonstrated, on dogs with a gastric fistula, that mucus is secreted in very large and at times in enormous quantities when a 10 per cent. silver nitrate solution is brought into the small stomach. He explains this greatly increased secretion of mucus as an effort on the part of the mucosa to combat the deleterious action of the noxious substances on the mucous memb ane. My clinical observations corroborate this; they show that when the silver nitrate is used in diluted solutions (1 to 5000 up to 1 to 1000) its power to induce an increased secretion of mucus may be turned to advantage as a therapeutic agent. We thus find an explanation for the well-known beneficial effects of the silver treatment.

Another common treatment is thus satisfactorily explained, that is, the oil treatment. Oil taken before meals spreads quickly over the gastric mucosa and provides it with an artificial protective covering, in cases in which the natural protective layer of mucus is insufficient.

Lack of Mucus and Gastric Ulcer. An insufficient covering of the mucosa may lead to more serious disturbances than mere discomfort and pain. Experiments have shown that the layer of mucus protects the gastric mucosa against mechanical (Sawriew),[7] thermic, and chemical insults (Zweig);[8] we may also assume that the layer of mucus is the best protection of the gastric mucosa against the action and invasion of bacteria, as was demonstrated by F. Müller[9] for the bronchial tubes and by Walthard[10] for the cervix.

Without sufficient covering of mucus the gastric mucosa becomes more easily injured by the many insults to which it is constantly subjected. When once injured, even though slightly, the damaged part becomes more prone to the invasion of bacteria and to the digestive action of the gastric juice. Again, the thinner the layer of protective mucus the easier will these secondary deleterious insults

[6] The Work of the Digestive Glands, English translation, London, 1902, p. 168.

[7] Inaug. Dissert., St. Petersburg, 1901.

[8] Archiv f. Verdauungskrankheiten, vol. xii, p. 364.

[9] Sitzungsberichte der Gesellschaft zur Beförderung der ges. Naturwissenschaften zu Marburg, 1896, Nr. 6.

[10] Centralblatt f. Bakterien- und Parasitenkunde, vol. xvii, p. 311.

to the injured mucous membrane take effect. Under such conditions the digestive activity of the gastric juice must be particularly pronounced when hyperacidity is present.

It is probable that such occurrences are the primary disturbances in the development of gastric ulcer. The majority of cases of gastric ulcer give a history of a more or less prolonged period of suffering from so-called hyperacidity symptoms. We have seen before that this suffering is just as much due to the lack of mucus as to the increased acidity.

We see now that the lack of mucus plays also a role in bringing about the first lesion of the mucous membrane. That in such cases the first superficial lesion may gradually grow and get deeper becomes clear when we consider the chronic nature of the gastritis which at the same time causes both the lack of mucus and the hyperacidity. The persistency of both these disturbances explains the development of the ulcer and also its eminently chronic character. We should bear this in mind when dealing with a gastric ulcer, and should try to treat all disturbances which cause the development of the ulcer and account for its chronicity. One of these disturbances is the lack of mucus. A treatment which brings about an increase of gastric mucus helps to cure the ulcer.

We thus understand the effect of the time-honored treatment of gastric ulcer by silver nitrate, which, as we have seen before, causes an increase of mucus. I frequently had good results by applying silver nitrate in cases in which the regular Leube-Ziemssen treatment had accomplished very little.

How important an increased secretion of mucus is for the healing of a gastric ulcer is demonstrated by the clinical experience that the development of a mucous gastritis proves more conclusively than anything else that the ulcer has healed. This clinical experience finds corroboration in Turck's interesting experiments. Turck,[11] who succeeded in producing artificial gastric ulcers in the dog, has lately studied the factors concerned in the healing of such ulcers. Among the changes noted during the process of repair he demonstrated a great increase of mycogen cells, in fact to such a degree that even zymogen cells were transformed into mycogen cells.[12] We thus see that this transformation, while it is really a pathological change, acts as a beneficial agent in the healing of an ulcer.

A similar interpretation may be applied to other conditions which are accompanied by an increase of mucus: An increase of mucus, though apparently pathological, may often prove to be nothing but a more active manifestation of a useful function which serves to protect the mucous membrane. A. Schmidt[13] has explained the

[11] Ulcer of the Stomach; Pathogenesis and Pathology, Jour. Amer. Med. Assoc., June, 1906; British Med. Jour., April 20, 1907.

[12] F. B. Turck. Reported at the tenth annual meeting of the American Gastro-enterological Association, Atlantic City, N. J., June 3, 1907.

[13] Volkmann's Vorträge, N. S., Nr. 202, p. 1122.

profuse secretion of mucus from any mucous membrane as a favorable symptom, because it shows that the upper layers of the mucous membrane are not greatly degenerated. I should like to add that it should be considered a favorable symptom because it proves that the mucous membrane is doing its duty. From this point of view we must then consider the lack of mucus an unfavorable symptom, for we have seen that diminished secretion of mucus and insufficient mucous covering deprive the gastric mucosa of its protection against all harmful influences, and particularly against the digestive activity of its own secretion.

The routine examinations of stomach contents have so far been principally directed toward the secretion of gastric juice and its disturbances. A more careful study of the protective secretion of mucus and its disturbances will greatly help us to understand and to treat gastric diseases.

THE ETIOLOGY AND SYMPTOMATOLOGY OF CEREBOSPINAL MENINGITIS.

By Thomas A. Claytor, M.D.,

PROFESSOR OF THERAPEUTICS AND OF CLINICAL MEDICINE, GEORGE WASHINGTON UNIVERSITY; PHYSICIAN TO THE GARFIELD AND THE UNIVERSITY HOSPITALS, WASHINGTON, D. C.

Since its first recognition as a distinct disease by Vieusseux, in Geneva, in 1805, to the present day, epidemics of cerebrospinal fever have occurred at varying intervals and of varying severity, in widely separated localities, extending, according to Hirsch, from 45° N. (Montreal) to 30° N. (Mobile) in the Western Hemisphere, and from 63° N. (Sweden and Russia) to 30° N. (Jerusalem, Persia, and Algiers) in the Eastern Hemisphere. An even wider range might be given, however, as the disease has been noted as far South as Java between 5° and 6° S. In the vast majority of instances it has been impossible to trace the origin of one epidemic to another, only a few authentic examples of transfer of the contagion being on record

The eastern section of the United States has had a rather generous proportion of the world's epidemics, while the British Isles have been comparatively free, though during the past few months the disease has been prevalent in Belfast, Glasgow, and indeed throughout the United Kingdom, to a greater or less degree. I shall have occasion to refer, later, to reports of numerous epidemics, one of the most formidable being that which occurred in Upper Silesia in 1905, 3102 persons being attacked and 1789 dying.

Etiology. Cerebrospinal fever occurs most commonly in the winter and spring, but may be seen in the summer. It seems probable that overcrowding and bad hygiene, necessitated among the poorer

classes during the cold weather, may have something to do with the more frequent occurrence of epidemics during the seasons mentioned. It may occur epidemically or sporadically. In many of our cities a few cases are observed each year. There seems to be a tendency for the contagion to cling to a locality for some time after an epidemic has occurred, a few cases being observed there during the succeeding years. Neither sex, race, occupation, nor social condition seems to be of importance. One attack does not confer absolute immunity, as there seem to be a few instances at least in which there has been a bona fide previous attack.

AGE. Among predisposing factors age is the most important, children and young adults furnishing the large majority of victims. It is also interesting to note that in some epidemics nearly all the cases are among children, while in others young adults are chiefly affected.

Hirsch's deductions from 1267 fatal cases were: Under fifteen years, 71 per cent ; between fifteen and forty years, 26 per cent.; over forty years, 3 per cent. In the Upper Silesian epidemic, M. Wetsenhœffer[1] says that 90 per cent of the 3102 cases were under fifteen years of age. J S. Billings[2] states that in the New York epidemic, which began in 1904, of the 365 cases from which he obtained reports there were: Under one year, 16 per cent; between one and five years, 34 per cent.; and above fifty years only about 1.3 per cent. N. B. Foster,[3] in an analysis of 30 cases, gives approximately the following percentages: Under ten years, 40 per cent.; in the second decade, 37 per cent.; in the third decade, 7 per cent.; in the fourth decade, 9 per cent.; in the fifth decade, 7 per cent. Taves[4] gives the following figures from 105 cases: One year or younger, 9 per cent.; one to fifteen years, 82 per cent.; fifteen to twenty-five years, only 9 per cent. Councilman, Mallory, and Wright,[5] on the other hand, in their 111 cases, found only 1 under one year old. Lichtenstern[6] found only 23 out of 111 cases over thirty years old. Of 110 cases reported by W. B. French[7] from the epidemic in Washington, in 1898 and 1899, there were: One year and under, 12.7 per cent.; one to fifteen years, 49 per cent.; fifteen to forty years, 24.5 per cent ; over forty years, 13.6 per cent. Taking the figures given by Hirsch, Westenhoeffer, French, and Taves, whose method of division allows them to be conveniently combined, we see that of 4584 cases, over 78 per cent were fifteen years of age or younger

BACTERIOLOGY. The specific microörganism which is now considered to be the cause of cerebrospinal meningitis is Diplococcus

[1] Berl. klin. Woch., 1906.
[2] Med. Record, November 18, 1906.
[3] AMER. JOUR. MED SCIENCES, 1905.
[4] The Etiology and Diagnosis of Cerebrospinal Meningitis, Providence, 1906.
[5] AMER. JOUR. MED. SCI., March, 1898.
[6] Quoted by Councilman, Mallory, and Wright.
[7] Report of the Health Officer of the District of Columbia, 1899.

meningitidis or intracellularis, from the fact of its being found usually within the leukocytes. It was first described by Weichselbaum in 1887, though Lichtenstern, in 1885, found in the exudate from a case of meningitis a few, cocci sometimes singly, sometimes in groups, similar in arrangement to gonococci enclosed in the leukocytes. Weichselbaum's discovery attracted but little attention until it was emphasized by Jager, who found the organism in 12 cases of epidemic cerebrospinal fever in the garrison at Stuttgart, in 1895.

Diplococcus intracellularis has now been demonstrated in such a large majority of cases that there seems no doubt that it is the specific cause. Typical meningitis has been produced by injecting cultures of the meningococcus into the spinal canal of goats (Heubner, Councilman).

Among experiments upon animals some of the most interesting have been reported by Flexner,[8] who was able to produce in monkeys an acute inflammation of the meninges resembling that found in man in many respcets. To produce any appreciable effect on these animals it was necessary to inject a large quantity of a fresh culture into the spinal canal, as when thrown into a vein or into the tissues practically nothing occurred except slight local tenderness and swelling. The inflammation in monkeys extended to the membranes covering the olfactory lobes and into the ethmoid plate and nasal mucosa. The latter was often found inflamed, and smears from its surface often showed diplococci resembling in many respects Diplococcus intracellularis. In no case was he able, however, to cultivate this organism, which was probably due to its brief viability in the nose of the monkey. Flexner points out the important fact that the olfactory inflammation in these cases shows that the localization of the exudate at the base of the brain is not necessarily produced by an infection through the nasal mucosa, as has been urged by some.

As to whether the meningococcus is in all cases the specific agent in cerebrospinal meningitis of the epidemic type, there is some room for doubt, since in the reports of epidemics there is a considerable number in which other organisms, such as the pneumococcus, have been found. Thus, E. Marchal,[9] in an analysis of 418 epidemic cases, gives the meningococcus as the cause in 73.4 per cent.; the pneumococcus in 16 per cent., and other organisms in 10.5 per cent. And in 95 sporadic cases the meningococcus was the cause in 50.5 per cent , the pneumococcus in 42.1 per cent., and other organisms in 7.4 per cent. There have occurred in this city during the past few months 11 sporadic cases of cerebrospinal fever in which an organism has been found in the spinal fluid. They were divided as follows: Meningococcus, 6; influenza bacillus, 2; pneumococcus, 2; an unidentified bacillus, 1. H. Schottmüller[10] states that he found

[8] Jour. Exp. Med., March, 1907.
[9] Central. für Bakteriol., vol. xxxii, 1902–1903.
[10] Münch. med. Woch., Nrs. 34 to 36.

the meningococcus in 43 out of 49 epidemic cases, and that in three instances mixed infections were found—the tubercle bacillus, pneumococcus, and streptococcus. In Taves' 105 cases no organism other than the meningococcus was found. In Councilman's series mixed infections were not uncommon. Thus the pneumococcus was found seven times in connection with Diplococcus intracellularis, and Friedlander's bacillus once. These observers failed to find the meningococcus in the spinal fluid at autopsy in a case in which it had been obtained on a previous occasion by spinal puncture, showing that the organism may die out. M. Westenhoeffer[11] states that in the Upper Silesian epidemic Diplococcus intracellularis was the most common organism, but that mixed infections were very frequent. The most common mixed infection was that with Diplococcus crassus.

COMMUNICABILITY. This question is of the greatest importance, and yet we are in almost total ignorance concerning it. In fact, it has never been absolutely proved that it is contagious in the ordinarily accepted sense. Not a few observers have likened it to pneumonia in its communicability. There seems to be no tendency for the disease to cling to houses, as does tuberculosis, for instance, but it does cling to localities, as has already been said. After an epidemic sporadic cases are very likely to crop up for a greater or less number of succeeding years. Numerous instances are on record in which two or more persons have been stricken in the same house. I shall mention only one or two of the most striking instances as examples. Osler's[12] record of the "Wagner family" is so striking that I shall quote his words: (1) A son, a young man of about twenty years, returned home on Monday, February 7, complaining of severe pain in his head. He had fever with much vomiting, and his head and neck were arched. He was very delirious, became rapidly worse, and died on Saturday, the 12th. (2) A sister, who had helped to nurse her brother, was taken ill on Monday, the 14th, with similar symptoms, and died in four days. (3) A second sister became affected in a few days, and for two weeks was desperately ill; she then began to improve, and is now well. (4) The mother, who was worn out nursing the children, was taken ill on March 17, and died in two days. She had slept in the same bed with No. 3, who was admitted to the hospital and subsequently recovered

A. Gardner Robb,[13] of Belfast, speaks of 5 from one family, ranging in age from sixteen months to fifteen years, taken ill within four days of one another, and of 5 out of 6 in another family, who became ill within ten hours of one another, resulting in death to 4 within thirty hours; the sixth child was stricken ten days later and also died.

[11] Berl. klin. Woch., 1906.

[12] On the Etiology and Diagnosis of Cerebrospinal Fever, Cavendish Lecture, West London Medico-Soc., June 16, 1899.

[13] Lancet, Sondon, February 23, 1907.

It is quite evident that in Robb's cases these individuals must have been exposed to infection at about the same time, except the sixth child, who did not become ill for ten days. In the Wagner family, on the other hand, infection seemed to pass from one to the other.

Drs. Park and Bolduan[14] state that of 1500 cases, in a recent epidemic in New York, 200, representing 88 families, had been in direct contact with other patients and that many of these latter showed evidence of infection from still others. Rieger,[15] in 30 instances out of 77 cases, was able to trace the infection, either directly or indirectly, to those who were infected. The period of incubation is unknown, but is supposed to be about three days.

Mode of Entrance of the Organism. As to how the causal organism reaches the brain and spinal cord, or how it again emerges to infect others, we are still in ignorance. The most plausible theory is that the germs are inspired and, finding a resting place in the nasopharynx, in some way as yet undetermined reach the brain, perhaps through the lymphatics, the tonsils being the port of entrance or perhaps through the cribriform plate of the ethmoid bone. This theory has been strengthened by observations made along this line by Goodwin and Sholly,[16] who were able to isolate the meningococcus from the nasal secretions in 50 per cent. of 52 cases of cerebrospinal fever during the first two weeks of the disease, and in 10 per cent. of 45 of those most closely in contact with them. As a control the same test was made upon 55 students who had not knowingly been exposed to infection, and of these only two showed an organism which resembled the meningococcus culturally and pathologically, but which did not have the same specific agglutinins.

Westenhoeffer, in examining a number of cases in the Upper Silesian epidemic, found that in every case of acute disease an inflammatory reaction in the fauces, especially in the tonsil, was to be found. This inflammation spread over the whole fauces, to the posterior nares, into the cavities of the nose, and also downward on the posterior pharyngeal wall. Cultures from the areas showed the meningococcus and Diplococcus crassus sometimes in pure, sometimes in mixed culture. The organisms corresponded in several instances to those found in the spinal fluid. The same author[17] says that, in making cultures from the nose, care must be taken to go far back, as the cultures from the anterior nares are always negative, even though the organism be found deep in the cavities. He suggests that this is due to the drying effect of the air upon the anterior nares. Certainly the evidence thus far collected points to infection through the nasopharynx and probably through the lymphatics.

Symptoms. All grades of the disease may be seen; the description here given is of the severe type. The onset is usually sudden, those seized in most instances having been in excellent health. The sud-

[14] Med. Record, November 11, 1905.
[15] Klinisch. Jahrb., 1905–1906.
[16] Jour. Infect. Dis., 1906.
[17] Klinisch. Jahrb., 1905–1906.

denness of onset is well illustrated by the following case of Foster's: A man while walking along the street was seen suddenly to stumble and fall. He then had a convulsion, which was repeated after he was taken to a hospital. After recovery, the man said he had been in perfect health, and remembered no headache until he became conscious in the hospital.

Headache of an intense character is generally the first symptoms. The pain may be general or be especially in the occipital region; it has been described as remittent with exacerbations. Pain may extend down the back and spread around the body into the abdomen or into the joints. Vomiting is likely to occur In the fulminiating cases delirium, unconsciousness, and coma, with or without convulsions, rapidly ensue. There may be a remission upon the third day, as was observed in a case recently seen with Dr. Leech. Convulsions are much more common in children, and the younger the child the more likely are convulsions to occur. Rigidity of the postcervical muscles, with, later on, retraction of the head, is almost always observed. A common decubitus is upon the side, with the head thrown far back, the thighs flexed upon the abdomen, and the legs upon the thighs. Paralyses are often seen, such as ptosis, strabismus, etc., or of one limb, and occasionally a complete hemiplegia.

The tendon reflexes are variable, in some instances exaggerated, in others absent or greatly diminished, occasionally differing on the two sides, as was observed in my Case I. Koplik's[18] observations upon the Babinski reflex, if generally confirmed, are of great value; he found it present only exceptionally in cases of epidemic cerebrospinal meningitis, while present in 23 out of 52 cases of tuberculous meningitis. Its value is said not to be great in children under two years of age. Kernig's sign is of great diagnostic importance. In Billings' series it was absent in only 7 out of 365 cases, and was present in 87 per cent. of Taves' cases. It is, however, by no means pathognomonic of the disease under discussion, having been observed in other forms of meningitis, in pneumonia with cerebral symptoms, and in typhoid fever.

Hyperesthesia is said to be an important symptom, especially in the earlier stages, for after the onset of unconsciousness there may be almost complete anesthesia. Koplik found hyperesthesia rare in tuberculous meningitis. Irritability and restlessness are the rule. Photophobia is often observed. Incontinence of urine and feces is frequent, or there may be complete retention. Constipation is the rule. Fever is most variable. The pulse is usually regular and in proportion to the fever; the same may be said of the respirations, but they may be irregular or of the Cheyne-Stokes variety.

Koplik[19] speaks of hydrocephalus as a complication of the disease. The most important variety occurs very early, sometimes within

[18] Jour. Amer. Med. Assoc., April 6, 1907.
[19] Amer Jour. Med. Sci., April, 1907.

thirty hours of the initial symptoms. The overdistention of the ventricles causes such pressure upon the brain as to produce complete paralysis, the child lying limp. In these cases the typical signs, such as rigidity of the neck, opisthotonus, and Kernig's sign, may be absent, only to return when the pressure has been relieved by spinal puncture. Koplik lays great stress upon the value of Macewen's sign in diagnosticating this complication, both when it occurs early and later in the disease, except in children too young for their skulls to have become rigid (up to about one and one-half years).

Herpes and petechia seem to be the most common skin eruptions, both being observed in about 25 per cent. of all cases. The former is usually seen about the mouth, nose, or forehead, the latter on the trunk, on the extensor surface, and about the joints. The petechial eruption in some cases resembles so closely a brush-burn as to be mistaken for such. This mistake is not to be wondered at in cases in which restlessness is great and delirium violent. A number of other eruptions have been observed, such as urticaria, erythema, rose spots similar to those of typhoid fever, bullous, vesicular, and measly eruptions. Osler saw in three cases of his series a very remarkable rash which he describes as follows: "There was a diffuse livid erythema of great intensity, on which purpuric herpes developed —a vesicular rash the individual vesicles of which became filled with blood." It occurred in the neighborhood of the joints, particularly over the extensor surfaces of the knees, elbows, and about the ankles.

A leukocytosis is always present, and is said to persist even in the most protracted cases. There is a relative increase in the polymorphonuclear leukocytes. The fluid withdrawn by spinal puncture varies somewhat: it may be clear, turbid, purulent, or, more rarely, colored with blood. It is, however, generally turbid.

There is not, as a rule, much trouble in obtaining fluid by spinal puncture in these cases, but it has been noted that in some instances, a puncture through the lower lumbar interspaces may be negative, while one from the second might be positive. This is probably explained by the gravitation to the lower part of the canal of the thick floculent material, which will not pass through the needle. During intermissions the fluid often becomes clear. Usually an immediate examination of a smear obtained from the bottom of the tube in which the fluid has been received, if the latter be thick, or after centrifugalization, if it be clear, will result in the finding of Diplococcus intracellularis. More rarely the organism can only be found after cultures have been grown. To make a positive diagnosis it then only remains to identify the organism.

Prognosis. The mortality has varied greatly in different epidemics. It may be put down as from 20 to 80 per cent. During the earlier periods of epidemics the death rate is usually higher than it is later, the virulence of the infection seeming to diminish. The fulminant cases usually result in death. Generally speaking, the earlier

coma sets in, and the more profound it is, the worse is the prognosis. It is by no means impossible, however, for the coma to disappear and for the patient to recover. It is well not to be too sanguine because of the return of consciousness, however, for after hours or days coma may recur and death ultimately result. In Case II coma disappeared completely on the third day, and the patient was quite rational and comfortable; unconsciousness soon came on again, and death occurred on the fifth day of the disease. Permanent disabilities may remain after the attack, such as blindness, deafness, paralysis, chronic hydrocephalus, etc.

TREATMENT. Consideration of this point need not detain us long. Inasmuch as evidence points to at least a moderate amount of contagiousness in the disease, each patient should be isolated; and taking advantage of Flexner's observations, that when suspended in salt solution the meningococci rapidly die, it seems advisable, not only to douche the nose and pharynx of the patient with this harmless solution, but to have those in attendance do the same.

The pain and restlessness can best be controlled by morphine; ice should be applied to the head and back; food must be administered through the stomach tube when there is stupor or coma; the bowels should be kept open.

So far opening the spine and washing the cord has not been very successful. Spinal puncture should be done, not only for diagnostic purposes, but for the relief of cerebral pressure, especially when symptoms of this condition are particularly pronounced. The serum treatment is yet in the experimental stage, though Flexner[20] has had some success in his work along this line upon monkeys. A vaccine was prepared by Dr. Lindsay from cultures of the meningococcus obtained by spinal puncture in my Case I, but death occurred before it could be used. I have seen no published accounts of this method of treatment, but have heard that thus far it has not been successful.

In view of the terribly fatal nature of cerebrospinal fever, and in view of the fact that it seems impossible to make a diagnosis between inflammations of the meninges due to the meningococcus and those caused by other organisms, such as the pneumococcus, except by spinal puncture, all sporadic cases should be reported.

CASE I.—D. A., female, aged nineteen, married, was first seen by me at 5 P.M on March 12, 1907.

History. Her father was said to have died of meningitis some years previously; the family history was otherwise negative. She had always been nervous, wilful, hysterical, and subject to severe headaches. These facts have been mentioned because they had some bearing on the diagnosis. For several days she had complained of

[20] Since this article was written some very encouraging reports upon the curative effects of the serum have been issued.

headache, but it was not severe enough to prevent her going to the theatre on the 9th, or from playing poker on the evening of the 10th. On the morning of the 11th she had a severe headache, by evening it was intense, and she told her family she was a very sick woman. When she awoke on the 12th the pain was terrific, she vomited, and at once became unconscious. Vomiting was repeated only once or twice during the rest of her illness.

The Condition When Seen. Temperature, 100.4° F.; pulse, 100; respirations, 24; comatose but extremely restless, throwing herself from one side of the bed to the other; the eyes turned upward, the pupils equal and reacting to light sluggishly; no herpes; an extensive petechial eruption upon the lower thoracic and abdominal region. This rash occurred in areas of varying size, some as large as the palm of the hand, and resembled so closely large brush-burns that they were at first mistaken for bruises resulting from injuries received through the violence of her delirium. Later it appeared above the knee-joints.

Reflexes. The conjunctival reflex was absent, as were also the knee-jerks; there was no clonus; no Babinski's sign; no response to pin-pricks, except upon the soles of the feet, the palms of the hands, and the face. Some stiffness of the neck, but no retraction of the head. Kernig's sign was present to a decided degree. There was involuntary passage of urine and feces. Lungs and heart normal. No retraction of the abdomen. No enlargement of the spleen.

March 13. There was no decided change except that ptosis of the left lid had developed and perhaps greater sluggishness of the left pupil. Kernig's sign was more marked. She reacted promptly to pressure upon the supra-orbital nerve and to electrical stimulation. The leukocyte count was 12,500, with a decided increase in polynuclear leukocytes. The urine contained a trace of albumin and a heavy deposit of phosphates.

March 14. The head was greatly retracted, the patient apparently being obliged to lie on one or the other side. The thighs were flexed upon the body, the legs upon the thighs, the forearms upon the arms, the fingers clinched. A spinal puncture resulted in the withdrawal of a cloudy fluid in which Diplococcus intracellularis was found in large numbers. Cultures made at this time from the fluid showed the organism in pure culture, but those from the nasal secretions were negative as to the meningococcus. No improvement followed the puncture. The leukocytes had risen to 28,800.

March 15. The condition was worse. The pupils were widely dilated, there was no reaction of the right and a very sluggish reaction of the left pupil. A second spinal puncture was made, but only 2 c.c. of fluid was obtained. Dr. D. K. Shute examined the eyegrounds but found nothing unusual. There was progressive loss of power in the right arm and leg.

March 16. Complete hemiplegia of the right side. Pupils contracted and immobile. Death occurred at 10.40 A.M., just five days from the onset of definite symptoms and four days after coma developed. The temperature had but once reached 103°, and hovered most of the time a little above 101°. The pulse ranged between 100 and 140; the respirations between 24 and 48 to the minute.

Treatment. Feeding by the stomach tube; an initial purge; morphine for restlessness; ice to head and back; spinal puncture. No autopsy was allowed.

CASE II.—M. W., aged thirty-one years, married, a tile-setter, was seen with Dr. Frank Leech, April 1, 1907.

History. The only point of interest in the past history is an illness which occurred about eight years ago. It began as a painful swollen ankle-joint with a rapid involvement of a number of other joints, a very high fever, stiffness of the postcervical muscles, retraction of the head, delirium and coma which lasted for a week or more. Under large doses of salicylates recovery gradually took place. The diagnosis was acute inflammatory rheumatism complicated by meningitis. The symptoms were certainly very suggestive of cerebrospinal fever, but as no spinal puncture was made there is no proof.

Present Illness. Went to bed on the night of March 30, apparently in good health; awoke on the morning of the 31st with a bad headache; vomited and soon became delirious.

The Condition When Seen by Me April 1. Comatose; temperature about 101°; pulse irregular, 65 to 90; respirations normal; marked photophobia, but no irregularity of the pupils, no paralyses; great restlessness; no retraction of the head, though postcervical muscles seemed stiff and there was resistance when the head was pushed forward. Knee-jerks very weak; some tendency to clonus; no Babinski; Kernig's sign marked on both sides. A blotchy rash upon the face; a petechial rash on the body, especially on the lower thoracic region—here it was confluent, closely resembling large brush-burns; small petechial spots on the forearms. Complete retention of urine; involuntary passage of feces. Took little or no food. Heart and lungs were normal, the spleen not enlarged.

April 2. Improvement remarkable; rational; said he had no headache; temperature and respirations normal; pulse, 100. Kernig's sign still present; knee-jerks now exaggerated; pupils equal and reacting to light. We had gone with the intention of making a spinal puncture, but the marked improvement made us hesitate, fearing that the diagnosis of cerebrospinal meningitis might have been a mistake.

April 3. Mental condition not so good, temperature rising.

April 4. Much worse, comatose, head slightly retracted, neck stiff, pupils unequal, knee-jerks absent, Kernig's sign present. Herpes on lips; petechial rash not so distinct on body, but more pronounced on extensor surfaces of legs, especially in neighborhood of

joints. There seemed to be a tendency to symmetry in the distribution of the rash. Temperature, 104°; pulse, 150; respirations, irregular. Spinal puncture resulted in the withdrawal of turbid fluid containing much pus. Smears showed Diplococcus intracellularis in small numbers. No cultures were made from the nasopharynx. Death occurred the next morning. No autopsy.

The points worthy of note in these cases are: The complete paralysis of the right arm and leg in Case I; the history of what was possibly a previous attack in Case II; the marked improvement, with return to consciousness on the third day, with almost immediate recurrence of coma, in Case II; the great size of the areas of petechial eruption resembling brush-burns in both cases.

THE COMPLICATIONS AND SEQUELS OF TYPHOID FEVER.

By Clarence D. Selby, M.D.,
ATTENDING PHYSICIAN TO ST. VINCENT'S HOSPITAL, TOLEDO, OHIO.

Musser insists that many of the so-called relapses of typhoid fever are in reality localized infections. A. O. J. Kelly[1] goes farther in saying that he feels chagrined if he is unable to put his finger upon some definite cause for the return of the fever in a relapse; and that in many cases a gall-bladder infection will be found, in others an infection of the urinary tract, and in still others periostitis, osteitis, phlebitis, etc.

In order to illustrate the multiplicity of complications that may occur in typhoid fever, the following case reported by L. F. Friedrich[2] is cited, the striking features only being mentioned: Vomiting was persistent, and the vomitus consisted of mucus and bile, indicating gastric irritation. The abdominal symptoms were exaggerated. Petechiæ of large size, varying in color from bright red to dark brown, covered the abdomen, chest, and back. A severe diarrhœa was accompanied by many profuse hemorrhages. Jaundice was marked. An acute lobar pneumonia developed on the thirtieth day. Nephritis and cystitis arose, marked by alternating suppression and retention of urine and accompanied by uremic convulsions. There were nervous symptoms, delirium, coma, subsultus tendinum, carphology, and ataxia. The spine became tender and the overlying skin hyperesthetic. The patient became deaf. Herpes labialis developed and persisted, with a facial erysipelas supervening. At the end of the third month the bowel perforated, and a few days later the patient died.

[1] Amer. Jour. Med. Sci., 1906, cxxxii, 446, 744.
[2] Washington Med. Annals, July, 1905.

In a review of 793 cases occurring in v. Jaksch's clinic from 1889 to 1903, Skutezky[3] gives the following important statistics on complications: Intestinal hemorrhage occurred in 4.6 per cent., of which 40 per cent. were fatal. Perforation took place in 1.5 per cent. of the cases, with a mortality of 100 per cent. He does not state that any of the patients were operated upon. Jaundice was seen in 0.7 per cent. and cholecystitis in 0.3 per cent. Acute nephritis was found in 3.2 per cent., of which less than half proved fatal, and albuminuria of febrile origin was demonstrated in 12.3 per cent. Of the respiratory complications, bronchitis was noted in 38 per cent.; lobular pneumonia 5.5 per cent., with a mortality of 50 per cent.; lobar pneumonia in 3.1 per cent., and pleuritis with exudation 0.7 per cent. The circulatory organs listed as follows: myodegeneration of the heart 0.7 per cent., with a mortality of 80 per cent.; pericarditis 1 case, which recovered; endocarditis 1.89 per cent., of which less than half died; embolism, all ending fatally, 0.3 per cent.; and thrombosis 2.39 per cent., with 10 per cent. fatal. 0.5 per cent. had roseola hemorrhagica, 1.89 per cent. miliaria, and 0.75 per cent. herpes labialis. Bed-sores developed in 2.3 per cent.

Hemorrhage and Perforation. In their beginnings, hemorrhage and perforation are etiologically and pathologically similar. We may say their difference is one of degree rather than of variety. The ulceration or slough, as the case may be, results in the disintegration of the intestinal wall to varying depths. It may be deep enough to involve a vessel, or it may extend entirely through the wall, permitting the infecting contents to escape. The lesions are usually located on the free border of the intestine; consequently, this is the more common seat of the hemorrhage or the perforation. Fortunately the blood supply is relatively poor here. Were it not so the percentage of hemorrhages would be vastly larger than it now is. However, this same condition enhances necrosis and would seem thereby to predispose toward perforation. While this may be true theoretically, it does not hold pathologically.

Hemorrhage usually occurs at the end of the second week or during the third. Two-thirds of the patients recover. It varies greatly in onset and quantity, depending, of course, upon the relation of the ulcer to the vessel from which the bleeding comes; depending also upon the blood pressure and the rapidity with which the intestinal contents are forced along.

The frequency of perforation has been variously given as from 1 per cent. to 7 per cent. or 8 per cent. Curschman[4] says: "I believe that under the most unfavorable circumstances perforation occurs in not more than 3 per cent. of all cases." Taylor and Brooks do not hesitate to state that from 16,000 to 20,000 persons die annually

[3] Zeitschrift f. Heilkunde, 1906, pp. 27, ii, 14.
[4] Nothnagel's Spec. Path. und Therapie.

from this cause in the United States. Briggs is more modest and puts it at 10,000.

In investigating the anatomical location of perforation in 190 cases, Harte[5] found that 73 per cent. were in the first 30 cm. of the ileum above the ileocecal valve. Only 4 cases were more than a meter distant. In 7 cases the colon was perforated, five times the ascending colon, and one time each the transverse colon and the sigmoid flexure. Meckel's diverticulum was perforated three times and the appendix eight.

As was before said, the perforation usually happens opposite the mesenteric attachment, though rarely it may open into the mesentery and produce a retroperitoneal abscess, which may simulate an involved and broken-down gland. The perforation, as a rule, is single, but this is not necessarily a hard and fast rule, as cases are frequently reported with two or three and even more. In form it may be circular, oval, or cribriform. The margins are very frequently irregular, and the size varies greatly from that of a pinpoint up. The large, circular perforations are thought to be due to sloughing, and the pinpoint and cribriform to ulceration. Slit-like perforations are occasionally noted and thought to be due to traumatism, such as the pinching or sharp folding of a necrotic area by the movements of peristalsis. It is obvious that the escape of contents is relative to the size of the perforation. If the leakage be great, general peritonitis promptly ensues, and the symptoms of the peritonitis are often the first signs of the perforation noted. Very slight leakage may cause a localized peritonitis, with plastic cohesion of the nearby intestines. In this event, a walled-off abscess will in all probability result. Not infrequently the sloughing penetrates no farther than the subperitoneal coat, also terminating in a localized peritonitis.

It has recently been determined that certain interesting changes take place in the bone-marrow of typhoid fever patients. Longcope has found these changes in the marrow of the femur. They are congestion, œdema, lymphoid hyperplasia, and the presence of large phagocytic cells—all well pronounced. In addition, there are disseminated areas of necrosis and often degeneration of the single cell elements.

Lesions Elsewhere in the Digestive Tract. Complications such as pharyngitis, tonsillitis, and laryngitis may occur. Laryngitis is of particular interest. It may be simply an inflammation of the lining membrane, or, more seriously, an involvement of the deeper structures. In cases with laryngeal complications, ulceration and subsequent stricture are not infrequently the termination, or pus may form in and around the cartilages. This abscess formation is attended with danger in that it occasionally ruptures into the mediastinum. Emphysema sometimes follows. This infection of the

[5] Jour. Amer. Med. Assoc., October 28, 1905.

cartilages, according to Keen's report, resulted fatally in 71 out of 75 cases.

Well-authenticated ulcerations and consequent strictures of the œsophagus have been reported. Mitchell[6] writes of 6 cases and Courtney[7] of 2. Courtney states positively that in neither of his cases could the resulting strictures have been of traumatic origin. Both supervened prior to the convalescence from the typhoid fevers. As to why the larynx and the œsophagus should be the site of ulcers, there seems to be no anatomical explanation.

Appendicitis. Before leaving the alimentary tract, it is well to note the relation typhoid fever bears to appendicitis. It may act in two ways. The appendix may already be the site of a chronic inflammation, which simply needs the impetus of a typhoid infection to stir into activity the chronic process. Dieulafoy calls this "paratyphoid appendicitis," but this term is misleading, as it may be taken to mean an appendiceal inflammation due to that class of organisms known as "paratyphoid." Jopson[8] gives us a record of a case of appendicitis intercurrent with typhoid, in which operation demonstrated the presence of a concretion within the appendix. Secondly, the typhoid infection may involve the lymphatic tissues of the appendix. While pathologically this is nothing more than typhoid fever, clinically and anatomically it is appendicitis; and the resulting symptoms, particularly as regards pain and perforation of the appendix, are likely to complicate the diagnosis.

Intussusception. Bryant and Bragg had a patient who ran an ordinary course of typhoid fever for six weeks, when he was suddenly seized with pain in the right iliac region. There was no leukocytosis. Operation revealed the following condition: "The abdomen was filled with clear serum. The small intestine near the cecum was deeply congested. A short distance from the ileocecal juncture was an intussusception 20 cm. long, invaginated both ways. A short distance farther a second one was found 12 cm. long, also invaginated both ways. Still farther a third was found 7 cm. long. This was invaginated from the right. Beyond this the gut was normal in color excepting the infiltrated patches and lymph nodes, due to the typhoid."

Enlarged Mesenteric Glands. The mesenteric glands are almost uniformly enlarged. Occasionally they reach such size as to produce symptoms that warrent an operative search for an apparent perforation. Rowland[9] tells us of 2 cases of this nature, in which he describes some of the glands as being as large as small "hen's eggs." The glands usually the seat of the lesions are those of the ileocecal region. This is very easily understood. The enlargement

[6] Johns Hopkins Hospital Rep., vol. vii.
[7] Jour. Amer. Med. Assoc., December 2, 1905.
[8] Annals of Surgery, 1905, xlii, 738.
[9] Jour. Amer. Med. Assoc., February 17, 1906.

is due to the infiltration of leukocytes. Many bacilli are present. Foci of necrosis are scattered throughout and are possible precursors of universal softening and suppuration. But this latter condition, if the cases that rupture and produce peritonitis are a criterion, is rare. LeConte[10] was able to find but 4 reported cases up to 1904. Hemorrhage has been known to originate in these affected glands. Rostovtzeff[11] discovered a case of hemorrhage from a gland located near the appendix.

Abscess of the Spleen. Enlargement of the spleen is not a complication of typhoid fever; it is merely a symptom. It may be regarded as evidence of the general infection of the structures that are rich in lymphatic elements, and is analogous to the infiltration of the intestinal follicles. But there are instances in which the increase in size of the spleen has been due to abscess formation.

Harrington[12] had 2 such cases, one of which was revealed by autopsy and the other by an operation intended for that purpose. This second patient's convalescence was interrupted by osteomyelitis of the right femur. The value of this second case report is somewhat lessened by the bacteriological findings, which were Staphylococcus aureus and streptococcus, and also by the fact that the splenic abscess did not develop until the fifty-eighth day of the illness, when it came as a relapse. From these it may be assumed that the typhoid infection was the predisposing rather than the active cause.

Federman[13] reports an interesting instance of this complication. It is interesting because of the unaccounted-for leukocytosis discovered on the tenth day of the illness and continuing increasingly until reaching a maximum of 300,000 ten days after the temperature was normal, at which time a pleurisy appeared. An operation for the relief of this demonstrated not only a cloudy pleuritic effusion, but also a large abscess of the spleen containing brown, odorous pus.

Gall-bladder Complications and Sequels. With possiby the exceptions of hemorrhage and perforation, the gall-bladder complications and, more particularly, the late occurring sequels are the most important of the accidents of typhoid fever. Perhaps, it would be better to say the hepatic system, meaning to include the liver with its portal and biliary radicles in addition to the gall-bladder. Although these hepatic involvements have been recognized over a long period of years, the important additions to our knowledge are of recent date.

According to A. O. J. Kelly, investigators are unanimous on the following points: "(1) That the typhoid bacillus is regularly present in the gall-bladder, and commonly, in pure culture, in practically all cases of typhoid fever—indeed, it is the one region of the body from which a pure culture of the organism is most likely to be obtained;

[10] Jour. Amer. Med. Assoc., October, 1904, p. 1188.
[11] Botkin's Gazett (St. Petersburg), No. 16, 1902.
[12] Lancet, 1905, ii, 1393.
[13] Deut. med. Woch., 1905, p. 586.

(2) that the typhoid bacillus may persist in the gall-bladder, as well as within gallstones, weeks, months, even years, after the patient has recovered from an attack of typhoid fever; (3) that cholangitis and cholecystitis (catarrhal, suppurative, and gangrenous) are by no means infrequent complications of typhoid fever; and (4) that a history of typhoid fever may be obtained in many cholelithitic and cholecystitic subjects." The source of infection may be directly through the common bile duct from the duodenum, by way of the portal circulation, by way of the systemic circulation, by way of the lymphatic circulation, or directly through the wall of the gall-bladder. The general impression seems to favor the portal system as the contaminating pathway. However, there is some evidence supporting the general circulation as the infection carrier. Reference is especially made to primary typhoid cholecystitis and cholangitis without demonstrable intestinal lesions. Pratt[14] was the first to call particular attention to this rather anomalous condition. Since then cases of primary gall-bladder inflammation of typhoid origin have been noted by Cushing, Stewart,[15] Deaver,[16] and others. Ehrlich[17] has described a case of typhoid fever with the lesions localized primarily in the biliary passages and secondarily in the liver, the intestines remaining intact. He calls the disease "septic typhoid cholangitis."

The lesions of the gall-bladder vary from simple catarrhal inflammation to total destruction of the wall of the organ and peritonitis. Stones may or may not be present, and when present frequently contain the typhoid organism. The fluid contents of the infected gall-bladder may be clear bile, bile with shreds of mucus, or bile with pus, or, if the cystic duct be occluded, the contents may be wholly purulent.

The typhoid organisms may persist within the gall-bladder for an astonishingly long time. Many patients so burdened are apparently nowise harmed. Others show the effects of the continuous reinfection of the intestinal tract by the frequent discharge of virulent bacilli from a chronically inflamed gall-bladder. The first class, in particular, are the innocent harborers and disseminators of the disease, and as such are significant from an epidemiological point of view (Kelly).

LIVER. The liver may be slightly enlarged and soft. The lesions are enlargements of the lymphoid elements and small areas of necrosis. The typhoid bacillus may be found in a large proportion of these. Those not so burdened may be regarded as being due to the presence of the toxin. The foci vary in their involvements from a few cells to a large part of a lobule. If extensive, they may finally terminate in cirrhosis (Osler).

[14] AMER. JOUR. MED. SCI., November, 1901.
[15] Amer. Med., 1904, vii, 1018.
[16] AMER. JOUR. MED. SCI., September, 1906.
[17] Deut. med. Woch., vol. xxxii, No. 42.

The bile ducts are variously affected from mild catarrhal lesions to widespread suppurative cholangitis and, possibly, a resulting multiple abscess formation within the liver. These sterner degrees of infection may lead to abscess formation elsewhere within the body. Osler[18] speaks of suppurative pylephlebitis as one of the rarest sequels of typhoid fever. Swan reports an hepatic abscess resulting from an infective pylephlebitis originating by extension from an intestinal ulcer.

KIDNEY. Albuminuria is a not infrequent accompaniment of typhoid fever. Stolte[19] has found it in 60 per cent. of 371 cases. In the ordinary run of typhoid the kidneys are little, if at all, affected. In the severer cases there may be cloudy swelling of the epithelial cells, with more or less degeneration. Occasionally there are seen small areas of round-cell infiltration, in which softening and suppuration may take place. Acute parenchymatous nephritis occurred in 3 per cent. of Talley's series of 18,000 cases. Œdema as a result of this nephritis is not often produced, and, if the patient lives, the nephritis seldom becomes chronic. Hemorrhagic nephritis may be regarded as an exaggerated form of the parenchymatous nephritis. It tends strongly toward a uremic termination. Suppurative nephritis occurs occasionally, and in these cases the typhoid bacillus is ordinarily present.

URINARY BLADDER. Cystitis is a frequent and very annoying complication of the fever. Barring careless catheterization, it is always due to the presence of the typhoid bacillus in the urine. It seldom means more than a catarrhal inflammation of the bladder walls, though a so-called diphtheritic inflammation has been noted.

TESTICLE. This organ may be affected. However, it is a rare complication, and develops late in the disease or during convalescence. Suppuration occurs in 25 per cent. of all cases so affected. Atrophy is a rare sequence.

UTERUS. A rare instance of uterine typhoid infection has been noted by Lartigau.[20] It followed childbirth by two weeks, and after an illness of six weeks the patient died. No intestinal lesions were found, but the mesenteric glands were swollen and necrotic, with small abscesses. The kidneys also contained abscesses, and the left ovarian vein a partially softened thrombus. The cervix was covered with a hemorrhagic membrane. The typhoid organisms were obtained in culture from all the organs mentioned.

LUNGS. The pulmonary complications are the most frequent of typhoid fever. In a large percentage of cases, there is more or less hypostatic congestion. In many this hypostasis terminates in consolidation, and a bronchopneumonia ensues. Croupous pneumonia may occur early in the disease and is usually caused by the typhoid

[18] Edin. Med. Jour., November, 1887.
[19] Deut. Arch. f. klin. Med., vol. lxxxiii, 197.
[20] New York Med. Jour., June 16, 1900.

bacillus. Lobar pneumonia, as a complication, is usually due to the pneumococcus, but it is probable that the typhoid bacillus is able to produce a massive pneumonia, lobar in type. The typhoid organisms may invade an area the seat of a hemorrhagic infarction and there cause abscess formation and gangrene.

HEART AND CIRCULATORY SYSTEM. The heart muscle becomes more or less degenerated, and in severe cases presents a reddish-brown color, is flaccid, and easily torn. This myocarditis is not infrequent, but endocarditis and pericarditis are comparatively rare. Endarteritis with thrombosis is sometimes met with. The thrombi and emboli contain the bacilli and are a distinct menace to the health of the individual, as they may produce metastatic abscesses. The veins are affected in the same manner as are the arteries, but more frequently. Particularly is this true of the veins of the lower extremity. Resolution almost invariably takes place, though the recovery may be greatly prolonged.

MUSCULAR SYSTEM. Zenker has described two forms of muscle degeneration, the granular and the waxy. The former is similar to the advanced stages of fatty degeneration. The latter results in the contractile fibers becoming waxy, homogeneous masses. According to Bollack,[21] the recti are especially prone to this lesion. He says their fibers are likely to rupture and produce slight hemorrhage, making a starting point for an abscess.

BONES. Typhoid spine is an interesting complication. It was first emphasized by Gibney, who regards it as an acute inflammation of the periosteum and the fibrous structures of the spinal column. Osler considers it, however, in the light of hysterical or railroad spine, as a neurosis. McCrea[22] had 2 cases in which bony deposits were demonstrated by the *x*-rays, extending along the lateral ligaments and in 1 case into the intervertebral substance. The vertebræ involved are usually the lumbar.

Bones and cartilages elsewhere are the seats of both early and late complications of typhoid fever. These lesions are surprisingly common when investigated. They consist in osteitis, necrosis, periostitis, perichondritis, and so on, and are exceedingly difficult to cure. The sternum, the iliac crest, the ribs and their cartilages are the bones most frequently involved. The typhoid organism is easily obtained in culture from these lesions.

OTHER COMPLICATIONS. The parotid gland may harbor the bacillus, and as a result suppurate. Infection may extend into the ear, perhaps through the Eustachian tube or the blood. Middle-ear suppuration is a moderately common complication and very annoying. This may progress farther, as into the mastoid cells, with possibilites of cerebral involvements.

The nervous system throughout its entirety is subject to lesions.

[21] Deut. med. Woch., August 29, 1901.
[22] AMER. JOUR. MED. SCI., December, 1906.

It may be a neuritis involving any nerve. The tender toe of typhoid convalescence is of this nature. Meningitis is not a frequent complication, though a large number of patients do suffer more or less cerebral irritation; a few cases of brain abscess have been reported. Hoffman has described an atrophy of the brain, with a widening of the ventricles. Degeneration of the ganglion cells has been demonstrated.

In the eye necrosis of the cornea, thrombosis of the ophthalmic and orbital veins, emboli of the arteria centralis retinæ, or optic neuritis with atrophy of the disk may occur.

Conclusion. It is possible to have a complication or sequel of typhoid fever at any time during or after the course of the illness, and in any structure of the body where the bacillus may venture or its toxin permeate.

THE LARYNGEAL COMPLICATIONS OF TYPHOID FEVER.

WITH THE REPORT OF TWO CASES.

By Willy Rieser, M.D.,
ADJUNCT VISITING PHYSICIAN TO THE LEBANON HOSPITAL, NEW YORK CITY.

Laryngeal inflammation as a complication of typhoid fever was first observed and reported by Bayle.[1] A medical student convalescent from abdominal typhus, developed hoarseness, followed by œdema glottidis; an attempted tracheotomy was unsuccessful, the patient succumbing. Bayle's second case, also, was in a male adult who died of suffocation while convalescent on the twenty-ninth day of the disease, without any effort at operative interference. Isolated cases were reported from then on in the French literature, and in 1818 Joseph Frank of Leipzig, reported 2 cases based on the postmortem findings of Pommers and Horn. In 1825 Bouilard reported a case observed by him in 1822. A student of divinity, discharged from the hospital as cured, was admitted for hoarseness, cough, and dyspnœa. He died three days later without operative interference. The despair of these hapless sufferers has been faithfully portrayed by the early writers. Most of these tragic deaths occurred during convalescence or after the patient had been discharged as cured.

Louis, in his classical publication on gastro-intestinal diseases and abdominal typhus, in 1829 reported 4 original cases with necropsy findings. In the same year, Pockel, a military surgeon in the Braunschweiger Militar-Lazareth, performed the second authentic tracheotomy in typhoid laryngitis. The patient, a young man, convalescent of the fever, developed acute perichondritis with œdema glottidis.

[1] Société de médecine de Paris, August, 1808.

The operation gave immediate relief with ultimate recovery. This was the first successful tracheotomy in typhoid affections of the larynx. This patient breathing through his cannula, but otherwise hale and well, was still under observation in 1869.

The use of laryngeal bougies and efforts at dilating post-typhoid larngeal stenosis were first attempted by Deschange, of Paris, in 1848. The results appear not to have been favorable, since in no case was laryngeal function regained, although an improvement in phonation was observed. Porter[2] reported 2 cases tracheotomized, with recovery; the first recorded in England.

W. W. Keen,[3] of Philadelphia, in 1876, summarized the entire literature pertaining to this condition, collecting 169 cases. These he classified clinically and pathologically, giving to the profession a lucid and instructive description, the most complete in its consideration of the subject that had appeared up to that time.

In 1884, A Luning,[4] of Zurich, in an exhaustive thesis[5] again collated the literature, collecting 192 cases to which he added 2 of his own and 12 others with clinical data. From Luning's description it is evident he had no knowledge of Keen's earlier monograph, most of his collected material being presumably identical with that of Keen, who so assumes in his volume on *The Surgical Complications and Sequelæ of Typhoid*, published in 1896, wherein he completes his earlier work by adding Luning's 14 original cases and such others as had been reported since, his total being 221 cases.

In 1903, Homer Dupuy,[6] of New Orleans, reported 1 case with 34 collected ones; and, in 1905, Chevalier Jackson[7] published the collective findings of a routine laryngoscopic examination of 360 typhoid-fever patients in the Western Pennsylvania Hospital.

By a careful search of the accessible literature, I have collected 23 cases—reported since the publication of Dupuy's paper—by Francillon,[8] Halbron,[9] Picot,[10] Johnstone,[11] Quinlan,[12] Boston,[13] Del Aqua,[14] Day and Jackson,[15] Chevalier Jackson,[16] Roque et Banset,[17] Herbert,[18] Pater,[19] Wilson,[20] Pierat and Stordeur,[21] Weil and Lemaire.[22] These, with my own two cases, bring the total to

[2] Dublin Med. Journal, 1836.
[3] Keen's Toner Lecture.
[4] Deut. Archiv f. kliniche Chirurgie., 1884, Band. xxx.
[5] Uber. die Laryngo-und Tracheo-Stenose und ihre chirurgische Behandlung.
[6] New Orleans Medical and Surgical Journal, 1903.
[7] Amer. Jour. Med. Sci., 1905.
[8] Bull. et mém. hôp. de Paris, 1903, p. 257.
[9] Bull. et mém. de Soc. anat. de Paris, 1903, p. 699.
[10] Gaz. hebd. de sci. med., Bordeaux, 1904, p. 98.
[11] New York Med. News, 1905, p. 1021.
[12] Laryngoscope, St. Louis, 1905, p. 17.
[13] New York Med. Jour., 1907, p. 301.
[14] Clin. et prat. Treviglio, 1905, p. 146.
[15] Annals of Otology, Rhinology, and Laryngology, 1904, p. 24.
[16] Amer. Jour. Med. Sci., 1905, p. 861.
[17] Lyon médicale, 1903, p. 269.
[18] Chicago Medical Recorder, 1904, p. 509.
[19] Bull. et mém. Soc. anat. de Paris, 1904, p. 38.
[20] Jour. of Michigan med. Soc., Detroit, 1904, p. 400.
[21] Jour. med. de Bruxelle, 1907, p. 82.
[22] Archiv. intern. de laryngol., Paris, 1906, p. 899.

281, which, omitting Jackson's studies, include practically all the cases heretofore reported.

ETIOLOGY. As causative factors are to be considered:

1. The friction and irritation of the physiological acts of phonation and swallowing, and the pathological act of coughing, trifling insults in themselves, but constant in their repetition—operating on a surface which is part of an organism suffering from a general typhoid toxemia.

2. A mucous membrane itself in a state of catarrhal inflammation with swollen surface epithelium.

3. Thermic influences, such as heat or cold, or both in rapid succession, including sudden drafts.

4. Bacteria. That lymphoid tissue, regardless of its distribution in the human economy, may be subject to primary invasion by the Eberth bacillus is now accepted by most observers. The bacilli have been isolated in sections, and grown in pure culture from the larynx by Schulz[23] in 1894, W. Williams in 1901,[24] and R. W. Weil[25] in 1905. Herbert and Liebman[26] and also Chevalier Jackson[27] cultivated it in pure growth from the pus of perichondrical abscesses. The Klebs-Loeffler bacillus has been isolated in pure culture and as a mixed infection, the earlier pathologists recognizing a membranous or diphtheritic and a simple ulceration in typhoid fever. The streptococcus and other pathological bacteria usually present as a secondary infection may act as the primary factor. Roberts[28] reported a case of Ludwig's angina complicating typhoid fever, in which he succeeded in demonstrating streptococci in pure form. Murray[29] in 1903 reported a similar case.

5. In my own Case I, the submucous infiltration of the arytenoepiglottic folds was due to a direct extension of the pharyngeal involvement in a double parotitis.

6. Ditrichs attributed to dorsal decubitus a role in the etiology, holding that by gravity a venous statis with softening of the tissues of the posterior laryngeal wall might be produced, inviting abrasion and injury; and in the light of our present knowledge of the physical processes on immunity,[30] it is not unlikely that the decubitus weakens the native resistance of the mucous membrane to the entry of pathogenic organism.

PATHOLOGY. Ulcerative lesions of the larynx in typhoid fever, while recognized by the early pathologists, were considered an accidental foreign infection, Rokitansky of Vienna, in 1842, being the first to give this lesion careful study. With wonderful intelligence he anticipated our present conception of it, referring to it as a true

[23] Berl. klin. Wochenblatter, Band, xxxv.
[24] Diseases of the Upper Respir. Tract, 1901.
[25] Trans. New York Path. Soc., 1905.
[26] Chicago Med. Recorder, 1905.
[27] Ibid.
[28] American Medicine, 1901.
[29] American Medicine, 1903.
[30] Jonathan Wright. New York Med. Journal, 1907.

metastasis of the typhoid poison, in every sense analogous to the developments in the intestinal mucosa. Keen, in 1876, classified the lesions according to the degree or depth of tissue involvement, as inflammatory or submucous laryngitis, ulcerative laryngitis, and laryngeal perichondritis, of which neither stage can be sharply outlined, they at times overlapping one another. The frequency of its occurrence is stated by Luning to be 12 per cent., basing his statistics on 1032 autopsies. Of the 2000 Munich cases 10.7 per cent. showed laryngeal ulcer, and J. C. Baer[31] found laryngeal ulcer in 3.4 per cent. of 89 autopsies held at the Presbyterian and the Cook County Hospitals of Chicago.

The type of lesion most prevalent varies with the material of the observer. Luning divides the 12 per cent. of laryngeal lesions into 1.5 per cent. of simple or submucous laryngitis and a little over 5 per cent. each of ulcerative laryngitis and laryngeal perichondritis.

DISTRIBUTION. The findings at autopsy do not accord with clinical observation. In over 4000 autopsies collected by Luning, and his agree with the observations of Keen, the posterior laryngeal wall at the insertion of the vocal chords involving the cricoid cartilage, was the seat of the lesion in 60 per cent. The arytenoid cartilages and interspace the next, the aryteno-epiglottidean folds, epiglottis, and thyroid cartilage being least affected in the order named. Chevalier Jackson, in his series of 360 routine laryngoscopic examinations in typhoid fever subjects found ulcer present in 68 cases; the frequency of distribution being: epiglottis 42 times, aryteno-epiglottidean folds 22, interarytenoid space 18, and arytenoid cartilage 10.

Laryngeal inflammation may occur at any time between the first and the tenth weeks. Over 70 per cent. of the cases reported occurred after the third week. Of mine one was in the third and one in the sixth week. Ulceration of the larynx, shown by the collective statistics of all observers to be present in typhoid fever in from 10 to 18 per cent. of all the cases, is clinically diagnosticated in only a very small precentage of this number, perhaps one in twenty or less.

Clinically, the onset is, as a rule, insidious and unobserved. If it be during or before the fastigium, the patient, with sensibility benumbed, is too apathetic and indifferent to pain to make complaint, or delirium may becloud the symptoms. Extreme dyspnœa and suffocative spasm may be the first intimation that even a close observer may obtain of the grave process transpiring. In this asthenic state, the first attack may terminate fatally, or with great and agonizing effort the patient will cough up blood, stained sputum and serum, with temporary relief and easier breathing, only to be followed by recurrent seizures. In the greater number, however, this complication occurs when convalescence is well established; doctor and patient both secure in the belief that all danger is past

[31] AMER. JOUR. MED. SCI., 1905.

and no further difficulty need be anticipated. And equally to be dreaded here, is the stealthy onset masked by the treacherous mildness of the symptoms. These are in the order of their frequency: hoarseness, voice change, aphonia, inspiratory stridor, dyspnœa, cough of metallic or laryngeal character, and dysphagia. Any of these may be overlooked or misconstrued by the attendant as a manifestation of a simple post-typhoid asthenia, until, with tragic unexpectedness, an acute œdema of the glottis involves the sufferer in a desperate struggle with death. Or, again, without any of the violent respiratory exertion usually preceding suffocation, an asthenic apnœa, may, without the slightest warning of its approach, terminate life. Indeed, so sudden, terrible, and menacing to life are these conditions that they demand immediate and the boldest action. Surely foolhardiness has no place in the practice of medicine, but in a developing œdema glottidis, or threatened apnœa, timidity may be even more destructive to life, and prompt operative relief is the rational and conservative indication.

My Case II and one reported by J. W. Boyce[32] are cited in illustration:

J. H., admitted to Dr. Zemansky's service in convalescence from typhoid fever, on the tenth day in the Hospital and the thirty-seventh day since the onset of the fever, developed some hoarseness and a higher pitch of voice, with metallic cough, and inspiratory stridor. There was no dyspnœa or dysphagia. Laryngoscopy showed slight congestion of the laryngeal mucosa, with no ulceration or restricted movements of the cords. The symptoms were not at any time considered urgent, and with cocaine locally (2 per cent. spray) and ice externally, appeared speedily to clear up, so that no further trouble was apprehended; when without any further warning, forty-eight hours after the first signs, the patient developed an acute œdema of the glottis, with suffocative spasm, causing cyanosis and unconsciousness. An immediate laryngotomy performed with an ordinary pocket penknife, by Dr. London, of the house staff, saved the patient's life. So acute was the emergency that there was no time to send for instruments.

Boyce, of Pittsburg, reports a patient with laryngeal complication, who was taken to the operating-room to be tracheotomized as a precautionary measure, not because it was needed, but for fear it might come to be during the night in the doctor's absence. During the leisurely preparations for a systematic operation, he accidentally noticed that the patient had stopped breathing. The surgeon standing by with knife in hand was able to stab the patient on the instant, and it required ten minutes of artificial respiration before the patient could be trusted to do his own breathing. Dr. Boyce states there would have been no time to send to another room for instruments.

[32] Annals Otology, Laryngology, and Rhinology.

May such conditions not account for some of the unexplained, sudden deaths occurring during typhoid fever? It were far better, if by clinical signs and laryngoscopy, an early diagnosis were made and such emergency work anticipated by early and timely operation, with due surgical precaution.

In typhoid fever the slightest hoarseness or change of voice or cough should at once awaken suspicion, and in every case laryngoscopic investigation should be instituted; no complaint of pain, however slight referred to the throat in breathing or in swallowing, should fall on deaf ears; for in the words of W. W. Keen, such complaints may be "the vagaries of a delirious mind, but they may also prove to be the heralds of the greatest danger."

PROGNOSIS. Appended below are tables giving the general result of 243 collected cases of which clinical data were obtainable. The columns represent: (1) The entire mortality percentage, (2) the mortality percentage of operated cases, and (3) the mortality percentage of non-operated cases.

Collected by	Died.	Recovered.	Operated on.		Unoperated on.	
			Died.	Recovered.	Died.	Recovered.
W. W. Keen . . 197	132	65	55	44	77	21
Homer Dupuy . 26	13	13	7	6	9	4
Rieser 20	13	7	13	4	1	2
Total 243	158 or 65 %	85	75 or 58 %	54	87 or 76 %	27

These statistics would show laryngeal inflammation in typhoid fever to be a complication with a death rate next to that of intestinal perforation. They are not conclusive, however, since it cannot be stated how many of these fatalities are directly chargeable to the laryngeal condition and how many to the underlying general infection.

The comparison of the tables of mortality of the operative with the non-operative cases forms a convincing argument for operation; and it may be said that careful laryngoscopic observation with early operation will very greatly reduce an appalling, and, in part, a preventable mortality.

Of Jackson's 68 cases, 8 were tracheotomized, and not one death in the 8 was directly referable to the laryngeal complication.

TREATMENT. The first impulse after having made a diagnosis of laryngeal inflammation in typhoid fever should be to place the patient in a zone of safety—by that I mean under constant and competent observation—in readiness for immediate operative relief should demand therefor arise. Having thus secured the patient, steaming the larynx, or ice by the mouth, or an external pack may be

tried. Spraying locally with a 2 per cent. solution of cocaine or a 1 to 1000 solution of adrenalin chloride at times gives relief, blanching and contracting the tissues if the inflammation be slight and transitory; such medication may tide the patient over. If, however, symptoms be persistent or become aggravated, or if stenosis be established restricting the laryngeal function, operation should be resorted to, laryngotracheotomy being the rational measure. Intubation with the O'Dwyer tube has been performed with success, but is not an advisable operative proceeding; of 5 cases[33] [34] reported within the last two years in which intubation was performed, the results were unsatisfactory and later tracheotomy had to be resorted to in each case. By use of the tube in abscess formation or sloughing perichondritis, free drainage is interfered with. The danger of plugging is great and constant, and in the vitiated condition of the laryngeal tissues, the pressure of the tube itself may add to the existing ulceration.

The treatment of post-typhoid stenosis of the larynx and trachea belong to the domain of laryngology and it is not the purpose of this paper to discuss it.

Conclusion. Pathological involvement of the larynx is very much more frequent than is clinically diagnosticated. Clinically, laryngeal involvement may constitute one of the gravest complications of typhoid fever; the stealthy and sudden onset of œdema makes it particularly to be dreaded. Early tracheotomy is the rational and life-saving operation and should be performed as soon as stenosis is positively established. The frequency of this complication pathologically, and the possibility of its extreme clinical gravity, warrant that it receive more careful consideration than it has heretofore received in the text-books, in discussions of typhoid fever, and at the bedside of the patient.

Case I.—*Typhoid fever; intestinal hemorrhage; double parotitis with unilateral suppuration and œdema of the glottis.*

L. R., aged seventeen years, white. Born in United States. Occupation, optician's apprentice. Admitted to the service of Dr. A. P. Zemansky April 11, 1907.

The patient, a fully developed adult male, of large frame, had been in care of his family physician and came to the hospital in the second week of his illness, which had been diagnosticated as typhoid fever. From the time of his admission to April 21, the disease seemed to run a mildly even course. The temperature fluctuated between 102° and 103.4°; pulse from 80 to 90. Rose spots were present, and the spleen was enlarged. Leukocyte count 8600, with 32 per cent. lymphocytes. Widal reaction positive.

On April 22 and 23 the patient had recurrent, large intestinal

[33] J. H. Quinlan. The Laryngoscope, St. Louis, 1905.
[34] W. L. Boston. New York Med. Journal, 1907.

hemorrhages, with wide fluctuations in the temperature curve and presented the clinical picture of a severe and increasing toxemia.

April 24. Patient in a state of muttering, restless stupor. Tongue dry. Slight swelling observed beneath the left ear involving the parotid gland.

April 25. General condition unchanged, left parotid gland and entire cheek swollen, red, shining, and very tender. Right parotid gland slightly swollen. Blood examination: hemoglobin 70 per cent.; white blood count 8600.

April 27. Face very much swollen; deglutition difficult and painful. The pharyngeal tissues are deeply injected and swollen, almost occluding the pharyngeal cavity. Attempted laryngoscopic examination difficult and unsatisfactory. Temperature, 105°; pulse, 120; respiration, 30. Patient in stupor and very restless.

About 3 P.M. respiration became labored and difficult; lividity and cyanosis gradually developed, clearly indicating that the supraglottic laryngeal tissues had become involved and œdematous.

A high tracheotomy was performed with immediate respiratory relief. The patient remained in a stuperous condition thoroughly overcome with the severe typhoid toxemia, and died without regaining consciousness on April 28, at 12.25 P.M.

Cultures for Klebs-Loeffler bacillus from smears by the mouth and through the cannula were negative.

At postmortem, wound examination, to which we were restricted, showed the cartilaginous box of the larynx and the trachea absolutely normal. Firm pressure over the left parotid gland caused a free flow of pus through the left auditory canal.

CASE II.—*Typhoid fever with submucous laryngitis and acute œdema of the glottis.*

L. R., aged twenty-four years, white. Born in Germany. Single. Occupation, shipping clerk. Admitted to Dr. A. P. Zemansky's service April 12, 1907.

Patient, a well-built adult male, was admitted convalescent, in the fourth week of typhoid fever. The clinical course had been mild and without complication—his chief complaint now being marked asthenia.

From the time of admission to April 20, the patient's temperature was normal, and a gradual, steady improvement in his general condition was observed. Widal reaction positive.

On April 20 he developed hoarseness with slight cough, and an inspiratory stridor which seemed at times to become harsher, and then again entirely to disappear. There was no dyspnœa or dysphagia, and no complaint of other discomfort. Laryngoscopy showed some injection of the vocal cords without ulceration, or apparent restriction in movements.

Ice externally and by the mouth with a local spray of 2 per cent. solution of cocaine hydrochloride was ordered, the patient being kept under close observation.

Repeated laryngoscopy on April 21 showed no further lesion. The symptoms had apparently cleared up under treatment, there remaining only a persistent aphonia.

April 22. At 9 A.M., after a good night's rest, the patient very suddenly developed respiratory obstruction, became deeply cyanosed and was threatened with immediate suffocation. So sudden and complete was the development of this stenosis as to demand instant operative relief.

Laryngotomy by incision through the cricothyroid membrane was performed, and tube inserted by Dr. London of the house staff, who used an ordinary pocket penknife, the condition being too urgent to risk the delay involved in sending to the operating-room for instruments. Relief was prompt, cyanosis at once disappearing; respiration through the cannula became regular and unobstructed.

Swabs taken by the mouth and the cannula for cultures of Klebs-Loeffler bacillus proved negative.

June 1, 1907 The patient is still under observation and wearing the cannula. Laryngoscopy shows marked injection of the cords at their posterior commissure with restriction of movement. There is no visible ulceration. An attempt to remove the cannula was made about ten days after operation and once since then, but laryngeal breathing becoming difficult after three or four minutes, made it necessary each time to replace the cannula. Excepting a slight febrile reaction the temperature rising to 101.8° on the second day after operation, the patient's general health has not suffered any from his laryngeal complication.

PURULENT CEREBROSPINAL MENINGITIS CAUSED BY THE TYPHOID BACILLUS, WITHOUT THE USUAL INTESTINAL LESIONS OF TYPHOID FEVER.

By J. Norman Henry, M.D.,

CLINICAL PROFESSOR OF MEDICINE IN THE WOMAN'S MEDICAL COLLEGE OF PENNSYLVANIA; ASSISTANT PHYSICIAN TO THE PHILADELPHIA GENERAL HOSPITAL; PHYSICIAN TO THE OUT-PATIENT DEPARTMENT OF THE PENNSYLVANIA HOSPITAL,

AND

Randle C. Rosenberger, M.D.,

ASSISTANT PROFESSOR OF BACTERIOLOGY IN THE JEFFERSON MEDICAL COLLEGE; DIRECTOR OF THE CLINICAL LABORATORY OF THE PHILADELPHIA GENERAL HOSPITAL.

William W., colored, aged thirty-four years, a native of Virginia, a coal picker by occupation, was admitted to the Philadelphia General Hospital, to the service of Dr. F. P. Henry, on account of headache, dizziness, constipation, and fever. His father and mother are dead; cause unknown. His wife and one child are living and well.

He had the ordinary diseases of childhood; otherwise he has always been healthy. The present illness began six days before admission with headache, dizziness, and vomiting. He went to bed the next day, and was delirious on the third day. Severe pain in back of head, and some pains in the legs were his complaint. He had some fever, but no epistaxis. He passed fairly large quantities of urine.

On physical examination he was a large, muscular, well-nourished negro, who lay in bed with his head slightly retracted, very restless, groaning, and picking at the bedclothes. He was profoundly unconscious. The eyes showed marked congestion of bulbar and tarsal conjunctivæ, and slight ptosis of both lids. The eyes were drawn upward and to the left. The pupils were small, equal, but did not react to light. There was some mucopurulent discharge from the conjunctivæ. The tongue was coated, dry, and fissured. Sordes were on the lips and teeth; the breath was foul, but had no characteristic odor. The pulse was rapid, regular, and the tension high. The pulmonary resonance was good throughout. The breath sounds were loud and clear. A few moist rales were heard at the right base. The heart was normal. The abdomen was rigid, but no special areas of tenderness could be palpated. Liver dulness seemed to be normal. Spleen could not be palpated. The arms were flexed and held stiff; the legs were tossed about. The knee-jerks were about normal, the right slightly more prompt than the left. Plantar irritation caused the foot to be drawn up, and the toes to be flexed on both sides. The spine was rigid and slightly concave. The neck was rigid. Kernig's sign was present.

April 14. Lumbar puncture was performed and about 25 c.c. of a turbid fluid withdrawn, which, on standing, deposited a heavy purulent sediment.

April 5. Kernig's sign was still present; the arms were somewhat rigid. The knee-jerks were absent; plantar irritation elicited no response. Still profoundly unconscious. Lumbar puncture was again performed and 30 c.c. of turbid fluid withdrawn, and 3000 units of diphtheria antitoxin and 30 minims of lysol were injected into the canal. Hot packs seemed to have beneficial effects on convulsions, which were not so frequent or severe.

April 6. The condition grew worse. Examination of fluid from the spinal canal showed no diplococci of Weichselbaum, but a bacillus which looked like typhoid. Leukocytes, 14,000; Widal suggestive. Pulse rapid, weak, and almost imperceptible. Urine analysis: amber; flocculent; acid; 1030; hyaline casts, few large amorphous urates. Died at 5.15 P.M.

The cerebrospinal fluid was cloudy, alkaline in reaction, and contained small coagula. Cytoscopic examination showed 96 per cent. polynuclear cells, 2 per cent. lymphocytes, and 2 per cent. hyaline cells. Shreds of fibrin were also present. Bacteriological examination showed numerous bacilli, intracellular and extracel-

lular, principally in the polynuclear cells, though a few were also seen in the hyaline forms and lymphocytes. These organisms possessed the morphological and tinctorial properties of a typhoid-like organism.

Inoculations made into various culture media gave rise to a growth of an organism which resembled the typhoid bacillus; that is, grayish-white growth on agar, cloudiness in bouillon, slight acidulation without coagulation in milk, no gas production in lactose or saccharose media, no liquefaction of gelatin, and no indol production in cultures. This organism resembled in all particulars the bacteria observed in spreads, and was agglutinated in dilutions of 1 to 40 with a known typhoid serum and with the serum of the patient.

5 c.c. of blood was obtained (under aseptic precautions) from the vein of the arm and inoculated into 200 c.c. of bouillon. A growth was observed in twenty-four hours, and consisted of an extremely motile bacillus, Gram negative, and resembling in subcultures upon various media, the organism obtained from the cerebrospinal fluid. Agglutination was positive in dilutions of 1 to 40 with the patient's serum, and also with a known typhoid serum. Inoculations of 2 c.c. of a forty-eight-hour bouillon culture into the subcutaneous tissue of a guinea-pig failed to produce any pyogenic process.

At autopsy spreads and inoculations were made from the pus upon the brain. The spreads contained an organism identical with that observed in the cerebrospinal fluid during the life of the patient. A Gram negative motile bacillus was obtained which corresponded in all particulars with the organism isolated from the blood during life. Sections of the cord and cerebellum were stained with Loeffler's methylene blue and eosin, polychrome blue and eosin, and by the Gram-Weigert technique. Numerous intracellular and extracellular organisms were found, resembling the bacilli encountered in spreads and cultures; they were especially abundant in the cord.

This organism, from its morphological, tinctorial, and biological character, resembles in all particulars Bacillus typhosus.

Certain of the autopsy notes (made by Dr. A. J. Smith) are of particular interest: The spleen weighs 110 grams, and is not adherent; capsule is smooth and thin; the organ is of a dark-slate color, rather flaccid, and cuts with normal resistance. Cut surface, dark red; Malphigian bodies enlarged; vessels and trabeculæ not prominent. The intestines throughout are normal on the exterior; show venous congestion, and walls are quite thin. Mucous membrane of small intestine normal; toward ileocecal valve the membrane is injected, becoming red, and close to valve marked by points of hemorrhage. No follicular enlargement. Peyer's patches are large in their flat extent, but not raised; are pale and show no signs of typhoid, medullary swelling, or ulceration. Large intestine normal externally and

in thickness of wall; likewise shows venous congestion. Mucous surface is moderately congested in upper part; shows no ulceration. Appendix 8 cm. long, of normal caliber, extends toward median line, and is adherent to posterior peritoneal surface. The lumen opened, the mucous surface shows follicles as tiny, black spots; no ulceration. Mesenteric glands are slightly enlarged, fleshy in consistency, reddened in color. Kidneys show nothing indicative of typhoid infection. Dura mater is tense and congested; upon removal the pial vessels are deeply injected and their course marked out by surrounding yellowish lines of pus; no excess of meningeal fluid. At the base of the brain, about the pons and medulla, extending into the spinal cord, a large amount of pus wells out as in an abscess. Exposure of middle ear fails to show the presence of pus. Dura over base showed no evidence of extension of disease from nasal portion. Cord shows infection of vessels outside of dura; throughout its extent, and especially in upper two-thirds, it was covered with a purulent exudate, similar to that present upon the base and convexity of the brain.

Pathological Diagnosis. Purulent cerebrospinal meningitis; cloudy swelling of the liver and the kidneys; acute catarrhal enteritis, with enlargement of Peyer's patches.

The case reported is unusual because of presenting a purulent lesion caused by typhoid bacilli, and because of the absence of the customary intestinal lesions of typhoid fever. The patient died on the ninth day of his illness and the autopsy showed that beyond a very little enlargement of the mesenteric glands and a slight change in Peyer's patches, which change might easily be accounted for by the enteritis which was present, the patient showed no typical typhoid lesions.

A bacillus in pure culture, which seems fairly identified as the bacillus of Eberth, was isolated from the blood and the spinal fluid, from spreads and inoculations from the pus upon the brain, and was found in sections made from the cord and cerebellum.

Cole[1] reviews the literature of typhoid meningitis. He speaks of 14 cases reported by various authors in which there had been present purulent, fibrinopurulent, or hemorrhagic purulent meningitis, with general typhoid lesions. In 1 case, however, no autopsy was obtained. He also mentions 13 cases of similar purulent meningitis in which the identification of the typhoid bacillus was not so certain, and of several cases in which there was mixed infection of other germs and the typhoid bacillus.

Neumann and Schaeffer report a case similar to ours in that there was present purulent cerebrospinal meningitis without the usual typhoid lesions, and though the organism isolated by them from the

[1] Johns Hopkins Hospital Reports, 1905.

pus appeared in many respects similar to the bacillus of Eberth, they did not feel altogether satisfied to place it definitely in that class.

MacCallum reviews at length the pathology of the condition and finds "nothing peculiar in the histological study of typhoid meningitis unless it be the relative abundance of large phagocytic cells, found particularly about the veins, but also scattered through the tissues."

In our case there were a large number of polynuclear and mononuclear cells, but the large phagocytic cells did not predominate. In this instance the meningitis appears to have been a primary lesion due to the typhoid bacillus, and the intestines had escaped the ordinary lesions which would be expected to be present at the ninth day of typhoid fever. The history was very carefully reviewed in regard to the possibility of the patient having had typhoid fever at a recent date, and the first statement that the man had been ill but six days before admission was firmly adhered to.

CHRONIC FIBROUS MYOCARDITIS IN PROGRESSIVE MUSCULAR DYSTROPHY.

By C. H. Bunting, M.D.,

PROFESSOR OF PATHOLOGY IN THE UNIVERSITY OF VIRGINIA, CHARLOTTESVILLE, VIRGINIA.

The following case of progressive muscular dystrophy is reported because of the interesting associated lesion of the heart muscle, and not because it adds anything to our knowledge of the lesion of the striated muscle. The case came to postmortem examination at Bay View Hospital, Baltimore, during my service as pathologist to that institution. The patient was admitted the day previous to his death, in a moribund condition, so that satisfactory clinical examination was impossible, nor could a satisfactory history be obtained. It was learned subsequently that the patient was the only child of German parents; that his mother had died about a year previously of consumption; that the boy's trouble had begun when he was about five years of age, at which time, as quaintly expressed by the informant, "all of his legs seemed to be slipping down below his knees," and he became weak, losing gradually the power to walk and finally to help himself with his hands. Since about his ninth or tenth year he had been confined to a chair. He had always been able to talk clearly and to whistle.

The body presented the typical picture of muscular dystrophy, and almost identical with the picture shown by two cases of the family type previously reported by me. The autopsy protocol follows:

Frederick S. Male, white, aged fifteen years. Died October 2, 1905, 3.30 P.M. Postmortem, October 2, 5 P.M.

The body is that of an emaciated boy 130 cm. in length. There is extreme pallor of the skin and mucous membranes. The face is infantile in appearance. The genitalia are undeveloped and pubic hairs are absent. There is extreme atrophy of the upper arm on both sides, of the pectoral muscles, and of those about the scapula. The forearms and hands show no appreciable atrophy, and the muscles appear well developed. The legs are flexed on the body and at the knee, with the feet held in an equinovarus position. The thighs are much atrophied, especially the extensor group. On attempting to straighten the leg, there is found to be marked tension of the hamstring group. The calves are large and firmly contracted, and appear hypertrophied in contrast to the thighs.

On incision and dissection of the skin from the thorax, the pectoral muscles are found reduced to a thin sheet of fibrous tissue. Section of the rectus femoris shows it to be pale and fibrous in character, but it evidently still contains muscular tissue.

The abdominal cavity is found free from excess of fluid, with smooth, glistening peritoneal surfaces. There are old fibrous adhesions binding the mesocolon to adjacent coils of the small intestine, and the descending colon is displaced, lying in the mid-abdominal line.

The heart appears small and weighs 100 grams. The valves are normal. The surface of the heart and the cut surface of the muscle are extremely pale and of a grayish pink color. Section of the wall of the left ventricle shows numerous translucent areas, evidently fibrous in character, between groups of muscle fibers. These areas are not confined to any portion of the section, but lie for the most part just beneath the epicardium, and the subepicardial adipose tissue appears to invade the muscle. The heart wall is very firm.

The left lung is of grayish pink color over the greater part of its surface, becoming of a deep red in the posterior portion. The upper lobe is moist and congested on section, and appears air-containing throughout. The lower lobe shows the bronchi much dilated to their terminations and full of purulent material. About the smaller bronchi are areas which are opaque yellow in color and which appear consolidated. The right lung on section appears much more moist in its upper lobe, which is almost gelatinous, but appears air-containing except for a small area somewhat wedge-shaped, of a grayish color, and quite solid. In the lower part of the upper lobe and in the lower lobe the bronchi are diffusely dilated, are filled with pus, and surrounded by small areas of consolidation, as in the left lung.

The bronchial lymph glands are much swollen, almost gelatinous on section, and of a gray color. They are free from areas of caseation.

The spleen is larger than normal. Capsule and trabeculæ are delicate. The pulp is increased in amount, but is firm and cuts sharply. The Malpighian corpuscles are prominent. The liver is of normal size and weighs 980 grams. It shows no surface abnormality. The cut surface is uniformly cloudy; the lobules are indistinctly outlined, but apparently are enlarged. The gall bladder is shrunken and contains but a few centimeters of bile. The stomach is small and contracted. The mucosa is pale except for injection of the tips of the rugæ. The mucosa is covered with mucus. The pancreas appears normal. The mesenteric lymph glands are somewhat swollen; they are free from caseation. The left kidney is slightly above normal size. The capsule strips easily from a smooth injected surface. On section the cortex is wide with regular striation, injected vessels, and swollen cloudy parenchyma. The right kidney resembles the left. Weight 250 grams. The aorta appears small, and when opened measures but 3 cm. across at the origin of the left subclavian artery. The wall is thin, but very elastic. The bladder is contracted; its mucosa normal. The testicles are small and puerile. The intestine is normal except for quite marked injection. Both lateral lobes of the thyroid are large, but appear normal on section. The spinal cord shows no gross abnormality. Examination of brain not permitted.

Anatomical Diagnosis.—Progressive muscular dystrophy; chronic fibrous myocarditis; hypoplasia of the aorta; chronic suppurative bronchitis; diffuse bronchiectasis; bronchopneumonia; cloudy swelling of the viscera; hyperplastic bronchial lymphadenitis.

Microscopic Examination. *Pectoralis Major.* The muscle is entirely replaced by a mass of loose connective tissue, showing between fibrous areas of varying density numerous lobules of adipose tissue. Muscle fibers are nowhere to be seen in the section. Extending through the tissue are many large bloodvessels and nerves. The arteries and veins are free from intimal thickening, and the nerves show no abnormality, the axis cylinders and myelin sheaths being well preserved.

Rectus Femoris. Cross-section. The muscle fasciculi are separated by loose connective tissue containing many fat cells. In the fasciculi the muscle fibers are reduced in number and are separated from each other by a fairly dense, cell-poor connective tissue, which shows an invasion by adipose tissue in many places. The muscle fibers vary much in size, the majority being smaller than normal; although in every fasciculus there are numerous hypertrophied fibers. The fibers, as a rule, show wellmarked Cohnheim's fields, and appear normal, although here and there one finds a dense homogeneous, deeply eosin-staining hyaline fiber. The sarcolemma nuclei are increased in number, and in numerous hypertrophied fibers lie within the muscle cell. The neuromuscular bundles lie in the interfascicular connective tissue, and appear normal except

for a slight increase in the size of the muscle fibers. The arteries and nerves of the muscle show no lesions.

In longitudinal sections the striation of the non-hyaline fibers is well marked. The increase in sarcolemma nuclei is more apparent, the nuclei occurring in clusters and rows along both the atrophied and hypertrophied fibers.

Biceps Muscle. The section shows a picture similar to the above, except that the great majority of the fibers remaining are hypertrophied and show both hyaline and vacuolar degeneration.

Spinal Cord. Sections cut through cervical and lumbar enlargements and the dorsal cord show no lesions. There are no areas of sclerosis in the white matter, and the ganglion cells of the anterior horn are normal in number and appearance.

Cords of Lumbar Plexus. Section shows no appreciable abnormality.

The Heart. The pericardial surface is normal, and shows beneath it considerable adipose tissue. Its vessels are entirely free from sclerosis. Throughout the thickness of the heart wall there are areas in which muscle fibers are lacking and in which their place is taken by cell-poor fibrous tissue. This tissue is somewhat more lax toward the epicardium, being in many places firm and scar-like near the endocardium. There is no regularity of distribution of these patches, but they seem especially numerous toward the epicardium. There is considerable variation in the size of the muscle fibers, those toward the epicardium being, for the most part, small and atrophied in appearance and, as a rule, showing vacuolation of their centres. In the deeper layers many of the fibers are hypertrophied, and show often coarse, swollen, deeply staining nuclei. Vacuolation is frequent. There is also some segmentation and fragmentation. Pigment is not increased.

Aorta. The aorta shows a slight diffuse thickening of the intima, with here and there a somewhat elevated, more cellular nodule, in which the cells show fatty degeneration. The longitudinal muscle fibers of the intima are well developed, but are in many places vacuolated and have pale, swollen nuclei. In the deeper layers of the media muscle fibers appear unusually scarce and separated from the elastic lamellæ by an increased amount of fibrillar connective tissue.

Lung. The pleural surface is free from exudate, but the membrane shows a dilatation of the bloodvessels and an increase in fibrous connective tissue with round-cell infiltration. The septa of the lung also show an increase in connective tissue and are œdematous. The vessels of the lung are generally dilated. The bronchi throughout the section are dilated, and are filled with pus cells and desquamated epithelial cells. The walls of the bronchi are thickened and are infiltrated with round cells, while the lymphoid foci throughout the section are hyperplastic. The alveolar walls, especially near the bronchi, are infiltrated with round cells, and in places show

a fibrous increase. The alveolar content varies; generally it consists of desquamated epithelial cells and a granular precipitate, but in patches one finds an inflammatory exudate of fibrin, leukocytes, and desquamated cells, or simply of pus cells.

The Bronchial Lymph Glands. The section shows the lymph sinuses dilated, containing serum and a variety of cells, chiefly large mononuclear phagocytes. The follicles are rich in lymphocytes, and the germinal centres are very prominent. Mitotic figures are present.

Liver. The section shows no lesion beyond an extensive fatty degeneration of the parenchymatous cells.

Spleen. The spleen shows a hyperplasia of the Malpighian corpuscles and an infiltration of the pulp spaces and sinuses, with red blood cells and leukocytes. The pulp cells are increased in number.

Kidney. The section shows the organ to be normal except for the swollen granular condition of the parenchymatous cells, and the granular content of the tubules.

Testicle.—The spermatic tubules are lined by a single layer of undifferentiated cells. The interstitial tissue is œdematous. Interstitial cells numerous.

Stomach. The mucosa is covered by a thick layer of mucus and desquamated cells. The mucosa appears hypertrophic. In the well of the stomach many muscle fasciculi show a disappearance of muscle fibers and an invasion by connective tissue. Some of the fibers appear hypertrophied, while many are vacuolated.

The foregoing, then, is a typical case of muscular dystrophy of ten years' duration in a boy in his sixteenth year, with atrophy of the shoulder girdle and upper arm muscles, of the thigh muscles, and with apparent hypertrophy of the calves, and from the history probably no facial involvement. The lesion was farthest advanced in the pectoral group of muscles, which had been reduced to a thin sheet of connective tissue infiltrated with fat. Yet one may not conclude that the lesion began in that group, as the extent of the lesion may simply indicate a more rapid rate of progression in that group than in the other muscles affected.

The lesion of particular interest was that in the heart muscle. The similarity of the picture offered by the muscle of the left ventricle to that of the striated muscle was striking. There was degeneration, atrophy, and hypertrophy of fibers, and also a numerical atrophy, the fibers being replaced by scar tissue. The cell-poor and fibrous condition of this connective tissue and the absence of lymphoid infiltration seemed to give strong evidence that the process was not a recent one, but instead quite remote in point of time, and a process it seemed impossible to connect etiologically with the acute inflammatory bronchiectasis. In fact, there was in the postmortem findings no indication of a cause for the lesion. There was no sclerosis of

the coronary vessels, and the distribution of the lesion varied from that usually seen in cases of vascular disease. The patches of myocardial atrophy, instead of being more or less sharply limited to the inner layers of muscle adjacent to the endocardium, were scattered throughout the thickness of the heart wall and were most numerous close to the pericardium and the blood supply. The aorta was slightly reduced in diameter, and its intima somewhat thickened. Yet it does not appear probable that that slight variation from normal would throw sufficient excess of work on the heart to lead to such injury, without greater resulting dilatation and hypertrophy. In the absence of a careful and exact history of the case it is impossible to exclude absolutely the occurrence of some infectious disease that might have produced the primary injury to the heart muscle, yet if one may judge from the slight signs of injury such as one usually finds following fatal attacks of acute infections, that factor may safely be excluded.

Thus from a careful consideration of the case it is difficult to escape the conclusion that the heart lesion was part of the disease, and that in the cause of the lesion in the striated voluntary muscle one will find the cause of that in the heart.

In the attempt to ascertain whether the smooth muscle fibers were affected in any way I was limited in my search by the fact that the stomach was the only hollow viscus from which tissue had been preserved. Yet in the muscular wall of the stomach there were definite lesions, quite similar in character to those in the striated muscle, although much less extensive. In numerous fasciculi there was numerical atrophy of fibers and the fasciculi were invaded by connective tissue, as was clearly shown by a Mallory stain. Some of the remaining fibers were vacuolated and degenerated in appearance and others appeared hypertrophied.

In the wall of the aorta, also, the longitudinal fibers of the intima especially showed vacuolation and signs of degeneration, and the fibers of the media appeared less numerous than is normal for the age of the patient. There appeared also to be an increase in connective tissue in the media as well as a thickening of the intima.

One may not from a single case draw the conclusion that muscular dystrophy is a disease affecting all types of muscular tissue in the body, and only after searching the literature can he realize how inadequate are the reports of muscular dystrophy in postmortem examinations for the determination of the point in question. Neuropathologists generally seem to have been contented with the examination of portions of the voluntary muscles and of the nervous system from their cases, and to have made but casual notes, if any, of the state of the viscera; and although in a number of cases the gross appearance of the heart is noted, in but few is there mention of a microscopic examination. However, from the rather limited reported autopsies some give positive evidence of myocardial lesion.

Sachs and Brooks[1] report the autopsy findings in a case of Erb's juvenile type in a man of twenty-four, in whom "the myocardium shows a great diffuse fibroid infiltration which is most extensive in the wall of the left ventricle, where it is distinctly patchy in distribution. The intima of the aorta and the endocardium are slightly thickened, but hardly enough to be considered a pathological state. The coronary arteries are normal in appearance. The heart weighs 13 ounces." "The microscopic examination showed a much less degree of interstitial increase than the gross appearance led one to suppose. The wall of the left ventricle exhibited a moderate augmentation of the interstitium, the hyperplastic tissue being entirely of an adult type and being most abundant about the vessels. The papillary muscles showed proportionately a much greater interstitial increase. The cardiac muscle cells were found everywhere to be in a very natural condition, and, notwithstanding the apparent degeneration noted in the gross examination, there was no atrophy of the cells, no abnormal pigmentation, and no evidence of abnormal nuclear activities." As a result of finding the muscle cells normal, and in spite of the interstitial increase in tissue, the authors exclude the heart from involvement in the disease.

Goetz[2] reports the heart of a muscular dystrophy patient of ten and one-half years, as giving evidence at autopsy of being clearly somewhat involved in the firm consistency of its wall. He further reports, as a result of the clinical examination of 10 patients with muscular dystrophy, the ages of 9 of whom ranged from seven to nineteen years, the tenth being fifty-five years, that in 6 of the 10 the heart dulness was definitely increased.

Rinecker[3] notes, at the postmortem examination of a boy of eight and one-half years with muscular dystrophy and gastrocnemius hypertrophy, that the heart was hypertrophied.

Middleton,[4] in a boy aged sixteen, found the heart very small, the left ventricle contracted, and its myocardium pale. On microscopic examination there was no hyaline degeneration of the muscle fibers, and the only lesion was an increase of the interstitial connective tissue, not very pronounced. In a second subject, aged thirteen and one-half years, the heart weighed 3 ounces and appeared healthy.

Laignel and Lavastine[5] emphasize the clinical observation of extreme cardiac instability and palpitation in a male patient of twenty-seven with the facio-scapulo-humeral type.

Erb,[6] in a patient of thirteen, with hypertrophied calves and atrophy, elsewhere, notes merely that the heart was pale and flabby.

[1] Amer. Jour. Med. Sci., 1901, cxxii, 54.
[2] Würzburg, München, 1879.
[3] Verh. der Phys.-med. Gesellsch. in Würzburg, 1860, x, 15.
[4] Glasgow Med. Jour., 1884, xxii, 81.
[5] Arch. gén. de méd., 1901, N. S. v, 185.
[6] Deutsch. Zeitschrift. f. Nervenheilkunde, 1891, xiii, 173.

Cardarelli,[7] in a patient of fifteen years, with the Duchenne type, found the heart normal in size, of pale color, and with marked subepicardial fatty deposits. Charcot[8] found the heart uninvolved. Eulenberg and Cohnheim,[9] in a boy of thirteen, found the heart normal in size, well contracted, and with the muscle of a pale rose-violet color.

While those cases in which the heart has been thoroughly examined and shown to be the seat of chronic myocardial lesions are few in number, they seem sufficient to confirm me in the conclusion that, in the case here cited, the heart lesion was the result of the same cause as the lesion in the voluntary muscles, and thus a part of the disease. This conclusion seems more probable when one considers the rarity of advanced chronic myocarditis in very young patients, as a result of other diseases. As to the smooth muscle involvement, the data are insufficient to draw any general conclusion, and the determination of the frequency of the lesion and its relation to the dystrophic condition must be left for further observations.

CERTAIN UNUSUAL FORMS OF HEPATITIS.

By Douglas Symmers, M.D.,

ASSISTANT PATHOLOGIST TO THE NEW YORK HOSPITAL; ASSISTANT IN PATHOLOGY IN THE MEDICAL DEPARTMENT OF CORNELL UNIVERSITY, NEW YORK.

(From the Strecker Memorial Laboratory of the New York City Hospital.)

In atrophic cirrhosis of the liver anatomists have long recognized an essentially chronic lesion which is apt to display occasional signs of activity in the occurrence of fresh connective tissue formation and infiltration of round cells. For the greater part the role of the liver cells is passive, although certain regenerative efforts may be interpreted as departures in the opposite direction. Not all is known of the different stages through which the liver passes before emerging into this chronic state. It seems important, therefore, to call attention to certain more active inflammatory lesions of this organ, partly because of their clinical significance and partly because they tend to throw some light on the genesis of the more familiar forms of chronic indurative hepatitis.

From time to time cases of chronic cirrhosis of the liver are observed in which more or less acute changes have occurred as a terminal event. Eichorst,[1] for example, records the case of a man,

[7] Il Policlinico, 1896, iii, 453.
[8] Archives de Physiol., 1871–2, iv, 228.
[9] Verh. der Berliner med. Gesellsch., 1865–6, i, 191.
[1] Virchow's Archiv, 1897, cxlviii, 339.

forty-seven years of age, who was admitted in a delirious condition and of whom no history could be obtained. His general appearance was that of a drunkard. Two weeks after admission he died, and at the postmortem examination the liver was found to be tremendously enlarged, weighing 9600 grams and measuring 35 cm. transversely. Neither icterus nor ascites was present. Microscopically it was found that the connective tissue was increased throughout. In places it was multilobular in distribution, in other places monolobular. In those areas in which it surrounded several lobules the connective tissue was poor in cells and enclosed moderate numbers of bile ducts. Where it surrounded single lobules, however, the picture was quite different. Here the connective tissue was extraordinarily rich in round cells, and proliferation of bile ducts was very pronounced. Eichorst concluded that to an originally multilobular chronic cirrhosis there had been added, recently, active connective tissue proliferation around single lobules and marked regeneration of bile ducts.

Klein,[2] in an article on the anatomy of scarlatina, states that he studied the condition of the liver in 8 cases, and that in all of them the organ was enlarged. The liver cells were swollen, opaque, and granular. The connective tissue was greatly thickened and "contained greater or smaller collections of round cells, forming sometimes continuous cord-like or nodular cell accumulations around bile ducts and bloodvessels." Occasionally such accumulations of round cells were observed "in the connective tissue within the acini." Klein's communication is accompanied by an illustration showing an interlobular space made up of wide-meshed connective tissue infiltrated by moderate numbers of round cells. The liver cells proper are not represented. Although this observer's description of the changes exhibited by the liver in scarlatina are too vague to permit of comparison with those soon to be considered, it seems not unlikely that he was dealing with a similar lesion.

Obrzut,[3] under the title of *Chronische gelbe Atrophie oder acute Lebercirrhose?* gives a complete anatomical and histological description of a case which more closely resembles those to be dealt with presently than any other that I have been able to find in the current literature or in special works on diseases of the liver. Obrzut's patient, was a man, thirty years of age, who was admitted in an unconscious condition. It was learned of him, however, that in his twelfth year he had suffered a febrile attack, from which he recovered completely. He remained healthy until the twenty-third year, when he developed an affection which appeared to originate in the stomach and which was attended by pain in that region and vomiting. Seven years later the patient was seized by acute pain in the region of the

[2] Trans. Path. Soc., London, xxviii, 439.
[3] Wien. med. Jahrbücher, 1886, New Series, i, 463.

stomach, attended by frequent attacks of hematemesis and rapidly progressing jaundice. This illness extended over a period of sixteen weeks and resulted in death. At the postmortem examination it was found that the liver was greatly decreased in size, weighing 810 grams. It was firm in consistency and irregularly granular. On section the substance of the organ was irregularly divided into islands of yellowish tissue by reddish or pinkish bands. On microscopic examination it was found that the yellow areas corresponded to the remnants of the liver lobules, and that these were surrounded by bands of immature connective tissue densely infiltrated by round cells. Moreover, the connective tissue elements frequently invaded the islands of liver cells, cutting off individual cells or small groups of cells. Here and there in the lobular remnants were collections of round cells which communicated directly with those infiltrating the connective tissue at the periphery. In some instances there were round-cell foci which were completely surrounded by the liver cells, thus appearing to exist independently of those at the periphery. The cells in the central portions of the islands of liver tissue were atrophic, but their shape and arrangement were well preserved, while those at the periphery were irregularly disposed, their contour was altered, and their cytoplasm fatty. A further and very noticeable feature consisted in abundant proliferation of bile ducts.

During the past two years I have had a number of opportunities to study inflammatory lesions of the liver presenting changes in many ways similar to those described by Obrzut, but, nevertheless, differing in certain essentials. There seems to be little doubt, however, that they belong in the same general category. In preparing to add my cases to the literature I have omitted many details from the clinical histories and from the autopsy protocols which did not seem to bear any relationship to the changes in the liver. For the same reason a large amount of microscopic detail has been excluded.

Anatomically, two types of lesion may be described: (1) A simple subacute diffuse hepatitis, and (2) a combined acute and subacute diffuse hepatitis.

1. I have observed the simple subacute diffuse hepatitis on several occasions, most often as an accidental autopsy finding. In other instances, however, the subjects presented, in addition to the changes in the liver, ascites and evidences of more or less well advanced compensatory collateral venous circulation, especially well marked in the peritoneum in front of the kidneys. For obvious reasons some of these cases were overlooked clinically, others were naturally regarded as examples of ordinary atrophic cirrhosis of the liver. One patient, who also suffered from advanced tabes dorsalis, gave a history of recurring ascites of two years' duration. A girl of twenty presented the lesions of active secondary syphilis. A history of alcoholism was not infrequently admitted. In some of the cases slight jaundice was present

The liver in this condition is considerably enlarged, firm and heavy, and dull yellow in color. The capsule is irregularly thickened and lustreless, and numerous small reddish streaks or points are scattered through it. At various intervals the surface of the organ is made up of patches of perfectly smooth or faintly undulating tissue, while the intervening portions are occupied by groups of nodular elevations, which are conical or rounded in shape and poorly defined at the base, where they gradually merge into the surrounding tissue. Some of them, however, arise quite abruptly and are sharply defined. The individual prominences may be closely aggregated or widely separated by strips of smooth tissue. On section the organ cuts firmly. Scattered at irregular intervals over the cut surface are islands of cream colored, occasionally bile stained, tissue. These islands are slightly elevated, so that the surface feels granular. Most of them are rounded or conical, others are angular. The depressions between them are occupied by bands of glistening, grayish tissue, dispersed through which are numbers of reddish points or streaks. For the most part the islands and trabeculæ are well differentiated, but in many places the definition between them is obscure.

Microscopically it is found that there is a marked overgrowth of embryonic connective tissue which serves to divide the parenchyma into islands of different sizes and frequently of irregular contour. The connective tissue bands are broad and made up of numerous delicate, pale, poorly staining, loosely woven fibrillæ, distributed among which are vast numbers of round cells and fibroblasts. Here and there the round cells are so abundant and so closely packed as to resemble abscesses, and in these situations the connective tissue fibrils are scarcely visible. Within the islands of liver tissue the columnar formation of the cells is lost. The liver cells are pale, markedly swollen, indistinctly outlined, opaque, and finely granular; in other words, in a condition indistinguishable from cloudy swelling. In some instances bile imbibition occurs.

Occasionally there is an attempt at reproduction of bile ducts, but this occurs in isolated places only and is not prominent. Here and there the immature connective tissue supports collections of thin-walled, evidently newly formed bloodvessels, many of which are distended (Fig. 1).

2. The examples of combined acute and subacute diffuse hepatitis are described below in greater detail, because the clinical features are important and suggestive.

Case I.—Female, married, white, aged thirty years, was admitted to the City Hospital, February 20, 1907, and died March 7, 1907.

The patient entered the Hospital complaining of pain and tingling sensations in the legs and of inability to walk. She was a housewife, and admitted having been accustomed to the use of one or two pints of beer a day for a long while, but stated that since New Year's

she had been addicted to the excessive use of whisky, often of a cheap grade, taking it not infrequently before breakfast.

On February 17 she noticed that she was beginning to have some difficulty in walking, and that her feet ached and were the seat of tingling sensations. Three days later she was entirely unable to walk, both feet were helplessly extended, the lower limbs were tender to pressure exerted along the line of the great nerve trunks, and the knee-jerks were not obtainable. At this time the patient could use the hands freely. Two days later she complained of

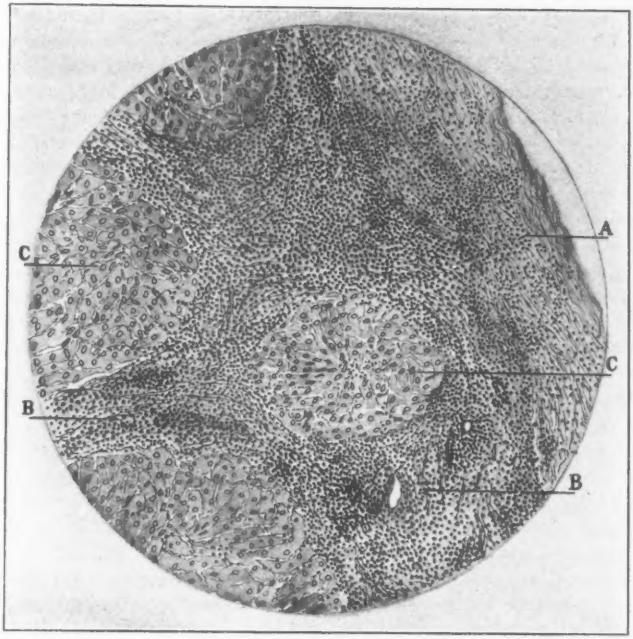

FIG. 1.—Simple subacute diffuse hepatitis. *A*, thickened capsule richly infiltrated with round cells; *B*, trabeculæ of finely fibrillar connective tissue densely infiltrated with round cells; *C*, cloudy swollen liver cells.

tingling sensations in the hands and forearms, and three days after this both hands were in the position of wrist-drop and were quite powerless. At the time of admission it was noticed that the patient's conjunctivæ were faintly jaundiced, and during the fifteen days that she was under observation jaundice gradually extended until, toward the end, it had involved the skin of the entire body. The liver was palpable 8 cm. below the right costal margin in the mid-mamillary line. It appeared to the palpating hand to be perfectly

smooth and quite firm. There was some tenderness over the organ, but no friction rub was detected. The spleen was palpated in the posterior part of the left hypochondrium. During the first eight days that she was under observation the patient's temperature registered between 100° and 100.4° F. in the evening. On the evening of the ninth day it registered 101.4° F., and every evening thereafter until the time of death, that is, six days, the evening temperature reached 102° F. or a fraction above this point. Death occurred on the fifteenth day. The patient was conscious until the end. At no time was there delirium.

Examination of the urine showed normal specific gravity, albumin, but no casts or blood. Four days before death the leukocytes numbered 20,000, the differential count of which revealed 79 per cent. of polymorphonuclear cells and 21 per cent. of lymphocytes.

Autopsy: Nine hours postmortem. The body was well nourished and 161 cm. in length. The conjunctivæ and skin of the entire body were faintly jaundiced. There was slight pretibial œdema. On section the abdominal cavity was dry and the peritoneum appeared to be unchanged. The liver was very prominent, occupying the whole of the upper third of the abdominal cavity. The notch for the gall bladder appeared to be very deep because of the presence of a massive accessory tongue-shaped lobe projecting from the lower part of the right lobe into the right iliac fossa.

The spleen was enlarged, measuring 13 cm. in length, 9 cm. in breadth, and about 5 cm. in thickness. It was bluish in color, the surface was smooth and the capsule tense. On section the substance was swollen, friable, and finely mottled, deep red streaks intermingling with pale areas. On microscopic examination the follicles appeared to be larger than normal and richer in cells. Among the cells of the follicles were numerous eosinophiles. The pulp was abundant and richly infiltrated with polymorphonuclear leukocytes and eosinophiles. In addition there were immense numbers of cells with large, pale, vesicular nuclei, representing proliferating endothelial and connective tissue cells. In many instances the vessel walls were thick and hyaline, so that the lumen was partially or totally obliterated. The blood sinuses were prominent and filled by masses of fused, hyaline red cells.

The pancreas was large and firm and the lobules were well defined. The interlobular connective tissue was pinkish in color. On microscopic examination it was found that certain parts of the organ were intact. Sections taken from other sites, however, revealed the presence of thick bands of immature connective tissue, in which were scattered collections of round cells and numbers of thin-walled bloodvessels, apparently recently formed. The islands of pancreatic tissue enclosed in this fibrillar and highly cellular connective tissue were irregularly disposed, sharply defined, and usually rounded in shape.

The liver was large, firm in consistency, and weighed 3000 grams. The surface was cloudy, pale, and perfectly smooth. On section the organ cut firmly. Scattered over the cut surface were delicate bands of grayish or pinkish tissue between which were irregularly outlined, frequently angular islands of pale, very opaque tissue. Deep in the substance of the right lobe was a puckered area about a centimeter in length, roughly quadrangular in outline, with several pale, glistening bands radiating outward; it was deep blue in color at the centre and pale at the periphery. Microscopically it was found that the parenchyma was irregularly divided by delicate bands of badly staining connective tissue, the fibrils of which were pale, fine in texture, and loosely arranged. This tissue was rich in fibroblasts and abundantly infiltrated with round cells. It was most plentiful in the periportal spaces, from which point it sent off narrow trabeculæ of finely fibrillar, cellular connective tissue. These penetrated the lobules for various distances and at irregular intervals, dividing them into fragments of irregular contour. The liver cells were atypical in arrangement, indistinct in outline, pale, swollen, cloudy, and finely granular. In short, the hepatic cells were in a condition of marked cloudy swelling. A few of them were coarsely vacuolated. A very noticeable feature consisted in the frequent occurrence of large and small leukocytic foci lying either in the islands of liver cells or in the connective tissue. In the former situation they were composed very largely of polymorphonuclear leukocytes, among which were numbers of degenerating liver cells, nuclear fragments, and large cells with pale, oval nuclei, representing, probably, desquamated endothelial cells. At the periphery of such cell collections the capillaries contained numerous polymorphonuclear leukocytes. The cell foci in the connective tissue were composed largely of polymorphonuclear leukocytes, but partly of eosinophiles, round cells, and fibroblasts, the two latter elements being, of course, common to the connective tissue throughout. The connective tissue also supported, here and there, thin-walled vascular channels and collections of embryonic bile ducts.

Microscopic examination of the puckered area, mentioned in the description of the naked-eye appearances of the liver, revealed the presence of a matrix of densely cellular connective tissue, embedded in which were numbers of thin-walled bloodvessels. Non-vascular connective tissue prolongations extended outward from the periphery and were gradually lost among the liver cells. In the immediate vicinity the configuration of the liver lobules was greatly altered, and numerous dense collections of round cells were present.

Anatomical diagnosis: Acute parenchymatous degeneration of the heart; hypostasis of the lungs; acute splenitis; acute diffuse nephritis; chronic hemorrhagic gastritis; subacute interstitial pancreatitis; acute and subacute diffuse hepatitis; canalised infarction (?) in the right lobe of the liver; icterus.

CASE II.—Female, aged thirty years, married, white, was admitted to the City Hospital, August 11, 1906, and died August 29, 1906.

The patient entered the Hospital complaining of pains in the lower extremities. During the eighteen days that she was under observation her mental condition was such as to render her statements unreliable. It was learned from her husband, however, that she had been accustomed to the excessive use of alcohol for a number of years.

On admission the patient was semidelirious, and gradually lapsed into continuous muttering delirium. The conjunctivæ were of a lemon-yellow tint and the skin of the entire body was faintly jaundiced. Jaundice deepened slightly during the patient's stay in the Hospital, but at no time did it become a very striking feature. The forearms and legs were distinctly atrophied and the hands and feet were helplessly extended. The knee-jerks were not obtainable, and pressure showed tenderness along the line of the larger nerve trunks of the extremities.

The liver was palpable 6 cm. below the right costal margin in the mid-mamillary line and 12 cm. below the xiphoid. The organ was smooth and firm to the touch. The spleen was not felt. On the day of admission the patient's afternoon temperature registered 100.4° F. The following morning it registered 99° F., from which point it gradually rose and assumed a subcontinouus type with average daily variations of about 1.5° F. On the evening of the twelfth day it had reached 103.6° F., falling in the course of the next two days to 100.4° F. It ascended on the evening of the fifteenth day to 103° F. After this the evening temperature always exceeded this point by a fraction, never declining more than a degree in twenty-four hours. The pulse averaged 115 a minute for the first ten days, and gradually increased to about 140 beats to the minute. Death occurred on the eighteenth day.

The urine was dark amber in color, of high specific gravity; albumin and bile were present in considerable quantities; there was no sugar, the urea content was greatly reduced, and neither leucin nor tyrosin was detected. Numerous granular casts were found.

Examination of the blood eight days before death revealed 5,500,000 red cells and 12,200 leukocytes. The following is the differential count of the white cells: Polymorphonuclear, 64 per cent.; small lymphocytes, 34 per cent.; large lymphocytes, 1 per cent.; basophiles, 1 per cent.

On the day before death the red cells numbered 4,480,000 and the leukocytes 20,400. The following differential count of the white cells was made: Polymorphonuclear, 88 per cent.; small lymphocytes, 5 per cent.; large lymphocytes, 6 per cent.; transitional cells, 1 per cent.

No Widal reaction was obtained with the bacillus typhosus.

Autopsy. Thirteen and one-half hours postmortem. The body was 155 cm. in length and the musculature and general nutrition

were good. There was considerable atrophy of the forearms and legs. The skin of the entire body was of a greenish-yellow tinge and the conjunctivæ were distinctly yellow. On section the abdominal cavity was dry and the peritoneum did not appear to be changed. The left lobe of the liver was very prominent, its lower edge lying 10 cm. below the tip of the xiphoid. This lobe then disappeared behind the left costal margin, and could be felt lying deep in the left hypochondrium over the spleen. The right lobe was visible beneath the right costal margin.

The spleen lay well behind the left lobe of the liver. It measured 15 cm. in length, 8 cm. in breadth, and about 5 cm. in thickness. The surface was smooth, steel-blue in color, and the organ was flabby. On section it cut readily; the surface was bluish in color and the substance was friable and scraped away easily. The pulp was abundant and bluish in color, the lymph follicles were distinguishable, and the connective tissue was not prominent. Microscopically the pulp was rich in red cells and the blood sinuses were distended. There was a considerable quantity of finely granular pigment scattered over the surface. The lymph follicles were fairly numerous, but small in size and poor in cells, and the vessel walls in the neighborhood were markedly thickened.

The liver was greatly enlarged, measuring 32 cm. from one extreme of the right lobe to the other extreme of the left. The right lobe was very thick anteroposteriorly, and measured 21 cm. from above downward. The left lobe was relatively flattened, but nevertheless thick, and measured 25 cm. from above downward. The organ weighed 2750 grams. The surface was dusky brown in color and perfectly smooth, except for a limited area just above the lower margin of the left lobe, where it was slightly granular on account of the presence under the capsule of a number of small, rounded or oval, bluish elevations. Scattered beneath the capsule of both the right and left lobes were innumerable bright red points or intercommunicating streaks. On section the organ was firm, dull yellow in color, and, for the greater part, the surface was smooth, a few small granular patches appearing here and there. The parenchyma was very irregularly divided into smaller or larger islands of different shapes by bands of grayish tissue, in which small, circumscribed, distinctly reddish bodies were distributed at irregular intervals. The islands of liver tissue were not elevated and their substance was pale and very cloudy.

Microscopically it was found that the changes presented were very irregular in distribution, and that they differed according to the part of the liver examined. Undoubtedly the most striking feature was to be found immediately under the capsule in the areas corresponding to the distribution of the bright red points and intercommunicating streaks and the bluish elevations mentioned in the description of the naked eye appearances of the liver. Here it was evident at a

glance that the parenchyma had been replaced in patches by a densely cellular tissue, in the midst of which were large numbers of thin-walled vascular channels filled by well preserved red cells. At first sight this picture conveyed the impression that the vascular channels were neither more nor less than dilated intralobular capillaries. On more detailed inspection, however, particularly after sections had been especially stained and the connective tissue fibrils brought into prominence, it became plain that these masses of tissue were inflammatory in nature, for it was now seen that they consisted of a matrix of delicately fibrillar connective tissue, in the meshes of which were multitudes of round cells, the whole enclosing large numbers of newly formed bloodvessels. The walls of the larger of these vessels, while quite thin, were made up of a connective tissue membrane which was several times again as thick as the normal reticulum of the intralobular capillaries. The inner surface of the vessels was distinctly paved with endothelial cells. In many sections it was not possible to demonstrate the point of origin of this tissue, while in others it obviously commenced in the interlobular connective tissue and thence extended outward to replace the liver lobules.

Deep in the substance of the organ the picture was quite different. Here, in places, the connective tissue was only moderately increased in patches and the liver cells were very fatty, the whole appearance corresponding to that of an ordinary fatty cirrhosis. In other places the lobular formation was well preserved and the connective tissue was not increased, while the liver cells showed advanced cloudy swelling.

In still other places, however, the interlobular connective tissue was considerably increased in quantity, delicately fibrillar and cellular. As one followed its ramifications small groups of thin-walled bloodvessels came into view at scattered intervals. In some instances the connective tissue in the immediate vicinity of these vessels was densely infiltrated by round cells; in other places it was comparatively non-cellular. The distribution of the connective tissue was such that it not only surrounded the liver lobules or portions of them, but insinuated itself between the liver cells, enveloping individual cells or small numbers of cells. The liver cells were thus supported in a complex network of delicate connective tissue fibrils and were made to assume various shapes and sizes. Their cytoplasm was dense, cloudy, and homogeneous. In some places the liver cells were coarsely vacuolated (Fig. 2).

Anatomical diagnosis: Acute parenchymatous degeneration of the heart; hypostasis and emphysema of the lungs; stasis of the spleen; chronic diffuse nephritis; chronic hemorrhagic gastritis; acute and subacute diffuse hepatitis; icterus.

CASE III.—Male, aged fifty-two years, white, single, coachman, was admitted to the City Hospital, October 31, 1906.

The patient admitted that he drank three or four glasses of whisky

daily, one of which he took before breakfast. He stated that in the midsummer of 1906 his friends had told him that his "eyes were yellow." At the time of his admission to the Hospital, about five months later, the patient's conjunctivæ were faintly jaundiced. During the first thirty-five days that he was under observation jaundice increased slightly in depth, but did not become very noticeable. On the thirty-sixth day the patient had a severe chill lasting one-half hour and preceded by slight fugitive pains in the abdomen.

FIG. 2.—Case II. Masses of finely fibrillar, densely cellular connective tissue supporting newly formed bloodvessels, irregularly distributed beneath the capsule and replacing the parenchyma. (The blood cells within the vessels have been omitted in order to preserve the effect.)

After the chill his temperature registered 104° F. Within thirty-six hours jaundice became extreme, and remained so until death occurred, sixteen days later. The day after the chill the patient's temperature fell to 98° F., rose in the evening to 102° F., fell to a point slightly above normal, fluctuated slightly for three days, rose again to 101° F., fell to normal and remained there until death. A few days before death the patient frequently vomited quantities of grumous blood, and similar material was passed in the stools. Examination of the blood on the day of the chill revealed 5800 white cells; six days later

the white cells numbered 9000. No malarial organisms were found. The urine was of normal specific gravity and contained bile, albumin, and hyaline casts.

Autopsy. The body was well nourished and 180 cm. in length. The conjunctivæ and the skin of the whole body were deeply jaundiced. The abdomen was dry. The left lobe of the liver occupied the epigastrium. No other part of the organ was visible.

The spleen was firmly adherent to the diaphragm. On removal it was found to be considerably increased in size, and its capsule was everywhere greatly thickened. On section the organ cut firmly and the surface was brownish in color. The interstitial tissue was very prominent, the vessels thickened. The Malpighian bodies could occasionally be made out as small, pale points. The pulp was brownish in color and not readily scraped away. On microscopic examination it was found that the interstitial tissue was markedly increased. The follicles were few in number and poor in cells, the vessels were thickened and, as a rule, showed hyaline changes in their walls and partial or complete obliteration of their lumina. The pulp was very atrophic. Here and there were hemorrhages into the pulp. The blood and lymph sinuses were largely obliterated.

On opening the duodenum and stomach, large amounts of grumous blood were removed. The mucosa of the stomach was extensively eroded, and there were numerous red points scattered over the surface, corresponding to ruptured vessels.

The liver weighed 2250 grams, and was enlarged, firm, the capsule thickened and opaque. At irregular intervals the surface presented groups of closely aggregated, sharply defined granulations, some of which were distinctly reddish in color, others were pale, and still others greenish. Between these roughened areas the surface of the organ was perfectly smooth. On section the liver cut firmly; the cut surface was pale, irregularly granular, and the elevated islands were surrounded by bands of pale, glistening tissue, in which were numerous reddish points.

On microscopic examination it was found that the parenchyma was irregularly cut into islands of various shapes and sizes. These islands were surrounded by broad bands of very loose, delicately fibrillar, actively proliferating connective tissue, which, at frequent intervals, supported groups of apparently newly formed bloodvessels, most of them injected. While throughout the liver the distribution of this cellular connective-tissue was largely confined to the periphery of the islands, the connective tissue elements not infrequently invaded the liver lobules and cut off small numbers of cells, which afterward rapidly disintegrated. It was evident that the formation of connective tissue throughout was recent. At no place was there any sign of old cirrhosis.

In addition to the rich content of round cells and fibroblasts in the connective tissue, a remarkable feature was presented in the occur-

rence at certain intervals of large or small cell foci made up almost exclusively of polymorphonuclear leukocytes, together with small numbers of eosinophiles. In exceptional instances similar collections were observed within the islands of liver cells.

The liver cells within the islands were irregularly arranged and in a condition of marked cloudy swelling. In many places hemorrhages were to be seen. These occurred most frequently in the lobular remnants, but were occasionally to be seen in the connective tissue. They varied in size from minute, point-like masses of red corpuscles to large collections destroying an entire island or several islands of liver cells. In the better preserved lobules bile precipitation was often to be made out in the liver cells.

Anatomical diagnosis: Acute parenchymatous degeneration of the heart; emphysema and extensive terminal hemorrhages of the lungs; chronic interstitial splenitis, terminal hemorrhages; acute diffuse adenitis; acute diffuse hemorrhagic nephritis; dilatation of the stomach, with widespread erosion of bloodvessels, producing enormous hemorrhage and destruction of the epithelial lining; chronic atrophic interstitial pancreatitis; acute and subacute diffuse hemorrhagic hepatitis; icterus.

Case IV.—Male, aged thirty-nine years, laborer, was admitted to the City Hospital, February 28, 1907; died March 19, 1907.

No satisfactory account of the patient's past history was obtained. He was admitted to the Erysipelas Pavilion because of a fading erysipelas rash on the face and right leg. The temperature was normal. Three days after admission he suffered a severe chill, followed by elevation of temperature to 104.3° F. An erysipelatous patch was now observed on the left cheek. This extended rapidly, and in the course of seven days had involved the face and scalp and the skin of the shoulders and back as far down as a line connecting the angles of the scapulæ. During the first three days of the attack the patient's temperature was constantly above 104° F. It then fell abruptly and fluctuated for several days between 100° and 102° F. Coincident with the pronounced decline in temperature the erysipelas rash began to disappear, and by the fifteenth day had practically gone away entirely. At this moment it was found that, despite the subsidence of erysipelas, the patient's temperature remained between 100° and 102° F., occasionally rising to 103° F., and that the conjunctivæ were jaundiced. Between the fifteenth and nineteenth days jaundice extended rapidly, and finally involved the skin of the entire body. On the day before death the patient complained of pain in the region of the right hypochondrium, and there was tenderness over the liver. Death occurred on the nineteenth day.

Autopsy. The body was well nourished and 180 cm. in length. The conjunctivæ and skin of practically the whole body were distinctly jaundiced. On opening the belly cavity, a quantity of clear,

yellowish fluid escaped. The peritoneum was moderately but diffusely thickened and pale.

On opening the pericardial sac, a large quantity of green, cloudy fluid escaped. Both layers of the pericardium were thinly overspread by fibrinous material, especially well marked in the region of the apex. The heart was markedly enlarged, the aortic valves were irregularly thickened and softened, and in places showed considerable loss of substance. The musculature of the heart was pinkish and very cloudy. Microscopic examination of the pericardium showed the usual appearances of an acute fibrinopurulent pericarditis, while the heart muscle was found to be in a condition of intense acute diffuse myocarditis.

The spleen was markedly enlarged. It measured 19 cm. in length, 14 cm. in breadth, and about 10 cm. in thickness, and weighed 870 grams. The capsule was tense, and on section the cut surface was bluish in color, the substance was prominent and friable, the pulp abundant and closely packed, the Malpighian bodies small in size and few in number. Microscopically the changes corresponded to those of acute splenitis, the blood sinuses being engorged and the pulp richly infiltrated with polymorphonuclear leukocytes.

The adrenals were markedly swollen and deep blue in color. Microscopically the changes indicated an intense acute diffuse suprarenal adenitis. On reflecting the descending colon, the finger broke into the body of the left psoas magnus muscle, releasing a large amount of cream-colored pus.

The naked-eye and microscopic appearances of the kidneys corresponded to those of an acute diffuse hemorrhagic nephritis.

The mucosa of the duodenum was swollen and opaque, especially around the opening of the bile papilla, where it was intensely injected. The bile papilla ejected thin watery material after pressure over the gall-bladder. On splitting up the larger bile ducts, it was found that the surface was thinly covered by tenacious mucus. The other structures of the portal space showed no changes to the naked eye.

The liver was enlarged, yellowish in color, and firm in consistency. The capsule was thickened and opaque, and presented numerous distinctly hemorrhagic looking streaks. Distributed over the surface at irregular intervals were groups of pinhead to pea-sized elevations, the individual nodules of which were separated from one another by strips of smooth tissue. Some of these elevated masses were pale, others were brownish, others distinctly red. The surface of the organ between the several groups of nodules was perfectly smooth or faintly undulating. On section the organ cut with difficulty, and the cut surface was rough and covered by numerous scattered, slightly elevated islands of pale tissue surrounded by pale or pink bands.

On microscopic examination it was found that the parenchyma was divided into islands of various sizes and shapes by broad bands

of pale, finely fibrillar, very cellular connective tissue. On close inspection it was apparent that, in addition to numbers of round cells and fibroblasts, the connective tissue was richly permeated by polymorphonuclear leukocytes, among which were small numbers of eosinophiles. A few fairly well circumscribed collections of polymorphonuclear leukocytes were observed within the islands of liver cells. Variable numbers of thin-walled bloodvessels could be seen in the connective tissue, and occasionally proliferated bile ducts. The liver cells showed widespread and well-marked cloudy swelling. Bile imbibition within the liver cells occurred at frequent intervals. Hemorrhages into the connective tissue and parenchyma were commonly observed; in the latter situation they often destroyed large masses of liver cells.

Anatomical diagnosis: Chronic peritonitis; acute fibrinopurulent pericarditis; acute diffuse myocarditis; acute splenitis; acute diffuse suprarenal adenitis; abscess of the left psoas muscle; acute diffuse hemorrhagic nephritis; acute duodenitis; acute papillitis; acute catarrhal cholangitis; hemorrhagic gastritis; acute and subacute diffuse hemorrhagic hepatitis; icterus; hydrops of the gall-bladder; ascites.

CASE V.—Female, aged forty-two years, was admitted June 5, 1906, and died June 12, 1906.

The patient was a washerwoman, and admitted that she used beer and gin "in moderation." She denied all history of syphilis, but stated that she had had two miscarriages. She was admitted to the Hospital complaining of gnawing sensations in the region of the stomach and nausea and vomiting of five weeks' duration. She said that three weeks before she came into the Hospital she had noticed that her abdomen was becoming larger and that her feet were swollen. On admission she was distinctly jaundiced. During the seven days that she was under observation vomiting was incessant. The abdomen was distended by fluid and the lower limbs œdematous. The abdomen was tapped the day after admission, and a large quantity of clear, straw-colored fluid was removed. After this the liver was palpable 2 cm. below the right costal margin in the parasternal line. The spleen was not felt. The patient's temperature was practically normal throughout. The day after admission the count of the white cells was 17,600; the differential count was normal.

Autopsy. Fifteen hours postmortem. Body poorly nourished. Skin distinctly jaundiced. On opening the abdomen about a liter of deep yellow, slightly turbid fluid was removed, and the peritoneum was found to be diffusely thickened, in places injected. The serous surface of the intestines was irregularly roughened and injected. The left lobe of the liver was visible 3 cm. below the tip of the xiphoid.

The spleen measured 9.5 cm. in length and 5.5 cm. in breadth. The naked-eye and microscopic appearances were those of chronic interstitial splenitis.

The liver was enlarged, pale, and firm, and the capsule was thickenened and opaque. The surface was granular at scattered intervals. On section the organ cut firmly and the surface was granular on account of the presence of numerous elevated masses of brownish or yellowish tissue. The spaces between these raised parts were occupied by pale or pinkish bands.

Microscopically the regions corresponding to the periportal spaces were found to be occupied by a network of embryonic connective tissue, which separated the lobules from one another and from which small off-shoots invaded the lobules at irregular intervals and divided them into islands of irregular shape. In some situations the connective tissue appeared as a pale, finely fibrillar, comparatively non-cellular network, but for the most part it was richly permeated by fibroblasts and round cells. In the connective tissue at frequent intervals were collections of cells composed for the most part of polymorphonuclear leukocytes and variable numbers of fibroblasts and round cells. The central portions of such foci were made up almost exclusively of densely aggregated masses of polymorphonuclear leukocytes. At the periphery the cells were fewer in number and less densely packed and consisted of variable proportions of polymorphonuclear leukocytes, round cells, and fibroblasts. These cell foci, however, were not confined to the connective tissue, but were even more frequently to be seen in the islands of liver cells; in fact, scarcely a lobular remnant could be found which had not been invaded to a greater or less extent. In many instances the liver islands were almost entirely replaced by dense collections of well preserved polymorphonuclear leukocytes, among which were degenerate liver cells, free nuclei, nuclear fragments, and desquamated endothelial cells, while at the periphery were numbers of irregularly disposed, pale, swollen, opaque liver cells. In some instances these cell foci were fairly well circumscribed, in other cases a direct connection could be traced between them and similar collections in the surrounding connective tissue. In occasional instances, however, islands of liver cells were found in which there were no evidences of the invasion of leukocytes, and in these places the cells were atypical in arrangement and showed advanced cloudy swelling (Fig. 3).

Anatomical diagnosis: Chronic diffuse peritonitis, mild acute exacerbation; acute parenchymatous degeneration of the heart; chronic interstitial splenitis; acute diffuse nephritis; acute and subacute diffuse hepatitis; icterus; ascites.

Recapitulation. It is obvious that the condition I have attempted to describe is anatomically distinct from chronic atrophic cirrhosis of the liver and from the known acute inflammatory or degenerative lesions of this organ.

In short, the uncomplicated subacute diffuse hepatitis is characterized, anatomically, by enlargement and induration of the liver,

with or without the appearance on the surface of irregularly scattered granulations, by cloudy, swollen liver cells, and by the formation of prominent bands of actively proliferating embryonic connective tissue, which are distributed throughout the organ in an extremely irregular fashion. This simple subacute inflammatory lesion may exist without giving rise to definite clinical manifestations, or it may be associated with a clinical picture closely resembling that so often seen in atrophic cirrhosis of the liver. Indeed, the

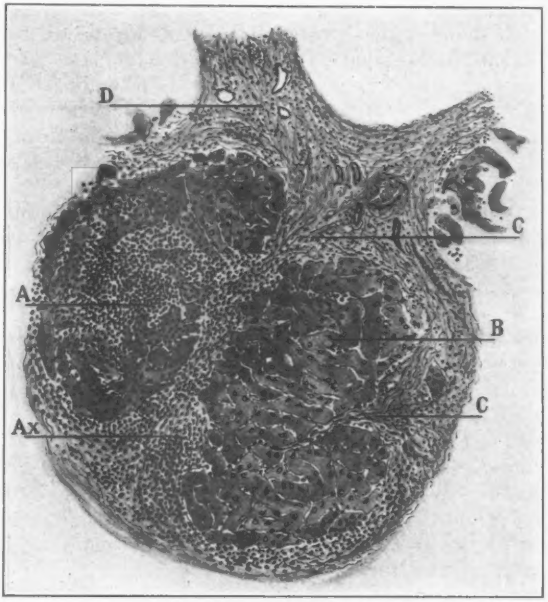

FIG. 3.—Case V. Showing a single lobule. *A*, polymorphonulcear leukocytes within the lobule and at *Ax*, infiltrating the connective tissue; *B*, swollen, cloudy liver cells; *C*, embryonic connective tissue invading the lobule; *D*, finely fibrillar, richly cellular connective tissue in the perilobular space.

nature of the pathological changes leaves little doubt that, under proper conditions, they could eventually resolve themselves into that familiar lesion. As far as the connective tissue proliferation is concerned, it would seem to represent merely a continuation in a greatly exaggerated degree of the hyperplasia referred to by many authors as the initial step in the production of cirrhosis (Birch-Hirschfeld, Strümpell, and others). The cloudy liver cells, which are a constant feature in the condition I have described, have nothing in common, however, with the liver cells in ordinary cirrhosis.

When the exudation of polymorphonuclear leukocytes and the occurrence of fresh hemorrhages are associated with anatomical changes in the liver such as have just been pictured, their presence can be interpreted only in the nature of an acute exacerbation. The discovery at the postmortem examination of a definite infective focus outside the liver makes such an interpretation inevitable. Failing this, if such acute changes, occurring in a liver already rendered vulnerable as a result of widespread injury, are associated with acute inflammatory or degenerative lesions in other organs, and clinically with such symptoms as more or less rapidly spreading jaundice, elevation of temperature, vomiting, and mental disturbances, we are justified in assuming that some infective agent has been operative at no very remote period. It is worthy of emphasis that the toxic agent seems to be capable, in some instances at least, of so effecting or furthering changes in the vessel walls that hemorrhages occur, not in the liver alone, but in other organs as well.

If, in view of these considerations, we should endeavor to classify the disease in accordance with the knowledge at our command, it would appear justifiable, both upon anatomical and clinical grounds, to assign it to a place midway between atrophic cirrhosis of the liver and the lesion or group of lesions commonly described under the heading of acute yellow atrophy.

Finally, the occurrence of such cases justifies the conclusion, I think, that a definite anatomical entity exists in the form of a subacute diffuse hepatitis *per se*, and that this lesion is subject to acute exacerbations.

The liver in Case II, especially the occurrence beneath the capsule of vast numbers of irregularly disposed groups of newly formed bloodvessels enclosed in a matrix of finely fibrillar, densely cellular embryonic connective tissue, constitutes, I believe, a unique anatomical lesion. At all events I have not been able to find a similar case described in the literature.

In closing I take great pleasure in acknowledging my gratitude to Dr. Harrison S. Martland for the drawings which accompany this communication. To Dr. Horst Oertel, director of the Strecker Memorial Laboratory, New York, and to my brother, Professor Wm. St. Clair Symmers, of Queen's College, Belfast, Ireland, I am deeply indebted for many valuable suggestions.

A CASE OF UNILATERAL MIXED NYSTAGMUS BENEFITED BY TREATMENT.[1]

By C. A. Veasey, M.D.,

ASSISTANT PROFESSOR OF DISEASES OF THE EYE IN THE JEFFERSON MEDICAL COLLEGE; OPHTHALMIC SURGEON TO THE METHODIST EPISCOPAL HOSPITAL, PHILADELPHIA.

Unilateral nystagmus is exceedingly rare, according to Duane,[2] some 50 or 60 cases only having been reported. Of these, by far the greater number are of the vertical type, Duane's summary being 34 vertical, 11 horizontal, 6 rotary, and 2 mixed. It is in the latter class that the following case belongs.

M. L., a girl aged twelve years, was first examined in April, 1907. There was a convergent concomitant strabismus of 15°, observed first at four years of age, the right being the squinting eye. The vision of the right was 6/7.5; of the left, 6/6. The ophthalmoscopic examination revealed nothing abnormal either in the media or fundi. The child was exceedingly nervous, and for two years had complained of involuntary movements of the right (squinting) eye. She had never observed any diplopia, nor could it be demonstrated, and there had never been noted any similar movements in the left eye, either by herself or by her mother. The ocular excursions were good in all directions, and she could converge to within $3\frac{1}{2}$ inches from the root of the nose. The pupillary reactions and the fields were normal. Binocular single vision was, of course, absent.

With her eyes in a primary position fixing a distant object, the nystagmus was at times mixed (vertical and rotary), at other times vertical only, and again purely rotary. This was demonstrated upon many different occasions. The rotary movements were from right to left; that is, contrary to the movements of the hands of a clock. The nystagmus was not always present, there being periods of rest, but it was always produced by bringing a stranger into the room, or by any other means that would make the child in the least degree nervous. With the eyes rotated upward or downward, the movements were always rotary. When the eyes were directed to the extreme right, the movements were mixed (vertical and rotary); to the extreme left, the movements were vertical only. If the head was tilted toward the right or toward the left shoulder, the movements were mixed. In forced convergence the movements did not differ in character from those observed when the eyes were in the position of rest, but the oscillations were more rapid and more prolonged. The nystagmic excursions were very short and rapid and were not altered by covering either eye.

[1] Read at a meeting of the Section on Ophthalmology of the College of Physicians of Philadelphia, October 15, 1907.

[2] The Ophthalmic Record, October, 1906.

The refractive error was corrected under atropine, the following being ordered: O. D. + S 2.25 D ⌒ + C 0.25 D axis 90°; O. S. + S 2.25 D ⌒ + C 0.50 D axis 90°, this being a half diopter less than the full correction.

After wearing these glasses for several weeks, during which time stereoscopic exercises were employed twice daily, the conditions had materially improved. The squint was now scarcely noticeable, being only about 5°. In the primary position there was now, at times, vertical nystagmus, appearing only when something caused the child to be very nervous. When looking to the extreme right or left, or upon rotating the eyes upward or downward, there were also vertical nystagmic movements. The movements now, however, always ceased as soon as the left (non-nystagmic) eye was covered. When the left eye was covered there was always an immediate slight outward movement of the right, in order to fix the object, and just as soon as this was accomplished the nystagmus ceased. There was no nystagmus now in forced accommodation until the point beyond which the eyes could converge was passed (3½ inches). In other words, so long as the patient employed the left eye for fixation there were periods of nystagmic movements in the right if the child became nervous, but whenever the right eye was used as the fixing eye all movements ceased and, under this condition, could not be induced.

This result is similar in some respects to that obtained in the case reported by Verhoeff before the American Ophthalmological Society at its last meeting. The paper, I believe, has not yet been published, but if I remember the case correctly, he had corrected the squint as far as possible by an operation, and then placed in front of the non-nystagmic eye a convex lens so strong (an addition of 1.50 D to the regular correction) that the patient could not see clearly through it for distance, being, therefore, compelled to employ the nystagmic eye, and under these conditions all nystagmic movements ceased. When the patient attempted to read, however, which could be done through the added lens, nystagmic movements were produced.

REVIEWS.

HUMAN ANATOMY, INCLUDING STRUCTURE AND DEVELOPMENT, AND PRACTICAL CONSIDERATIONS. By THOMAS DWIGHT, M.D., LL.D., Parkman Professor of Anatomy in Harvard University; CARL A. HAMANN, M.D., Professor of Anatomy in the Western Reserve University; J. PLAYFAIR MCMURRICH, Ph.D., Professor of Anatomy in the University of Michigan; GEORGE A. PIERSOL, M.D., Sc.D., Professor of Anatomy in the University of Pennsylvania; and J. WILLIAM WHITE, M.D., Ph.D., LL.D., John Rhea Barton Professor of Surgery in the University of Pennsylvania. With 1734 illustrations, of which 1522 are original, and largely from dissections by JOHN C. HEISLER, M.D., Professor of Anatomy in the Medico-Chirurgical College, Philadelphia. Edited by GEORGE A. PIERSOL. Pp. 2088. Philadelphia and London: J. B. Lippincott Company, 1907.

"WHAT," said Melancthon, "can be more ignominious than for a man not to know the structure and composition of his own body?" If this opinion of the great medieval scholar be true of man in general, the value of a knowledge of anatomy to those whose lives are devoted to the cure of bodily ailments cannot be expressed. That a knowledge of anatomy was to be gained only by the long practice of dissections, was the opinion of Vesalius; but the medical student today finds in his crowded curriculum all too little time for dissection, and it is necessary to supplement the practical work not only with didactic instruction, but by the provision of a text-book where may be found answers to all questions which might arise in the student's mind as his knowledge of anatomy is increased by vocal instruction and manual investigation. The preparation of the present work was undertaken, the editor tells us, "with three chief considerations in mind. (1) The presentation of the essential facts of human anatomy, regarded in its broadest sense, by a descriptive text, which, while concise, should be sufficiently comprehensive to include all that is necessary for a thorough understanding not only of the gross appearances and relations of the various parts of the human body, but also of their structure and development. (2) Adequate emphasis and explanation of the many and varied relations of anatomical details to the conditions claiming the atten-

tion of the physician and surgeon. (3) The elucidation of such text by illustrations that should portray actual dissections and preparations with fidelity and realism."

The accounts of the skeleton, including the joints, and of the gastropulmonary system and of the accessory organs of nutrition have been written by Dr. Dwight; Dr. Hamann has contributed the account of the cerebrospinal and sympathetic nerves; Professor McMurrich has supplied the systematic description of the muscular system and of the blood and lymph vascular system. Dr. Piersol has written the introductory, histological, and embryological paragraphs throughout the work; has contributed the description of the central nervous system and of the urogenital system; and, in his capacity as editor, has welded the various contributions into a homogeneous whole. The practical considerations have been contributed by Dr. J. William White, and the illustrations for this portion of the work have been made largely from dissections supplied by Prof. Gwilym G. Davis. The illustrations for the anatomical sections themselves have been drawn by the Messrs Faber from dissections by Prof. Heisler. The histological and embryological drawings are by Mr. Louis Schmidt.

The greatest departure in Piersol's *Anatomy* from the characteristics of other anatomies, contemporaneous and past, is in the amount of space (nearly one-fifth of the work) devoted to practical considerations. This is truly a sign of the times. Applied anatomy has gradually come to be regarded no longer as a mere appendage to systematic anatomy, but as a correlative branch—as the higher development of theoretical knowledge already gained; indeed some who are called enthusiasts dare to look forward to a day when applied anatomy will hold a much more important place in the curriculum of our medical schools than it does at present. The older surgeons, who received only systematic instruction in anatomy, found it desirable to work up the practical aspects of the anatomy of those regions in which they were particularly interested; and we have inherited their knowledge, and reverence their pioneer labors by attaching their names to the regions and structures they investigated. We thus speak of the triangles of Scarpa, of Petit, of Hesselbach; of the fascia propria and the ligamenta suspensoria of Sir Astley Cooper; of Hunter's canal; of Colles' fascia; of the ligaments of Poupart, Gimbernat, and Hey; of the aponeurosis of Denonvilliers, of Nélaton's line, etc., etc. Whatever may be the opinion as to the wisdom of attempting to combine applied with systematic anatomy in one bulky volume, there can be little unfavorable criticism directed to the manner in which the author of the practical considerations has accomplished the task assigned. In spite of the amount of matter contained in this portion of the work, the applications are, in many instances, rather suggested than expressly described, thus developing in the student a faculty for seeking for further practical

applications himself, but at the same time giving him ample foundations on which to build his superstructure. The influence of the forms of the bones, the architecture of the joints, and the action of the muscles, are described in relation to fractures and dislocations; the lymphatics and facial planes are considered in reference to inflammatory and cancerous metastases; while in the discussion of the nervous system, the thoracic and abdominal organs, and the genito-urinary tract, the character of the practical considerations embraces not only surgical affections, but many of a medical nature as well. There is, however, this unavoidable drawback, that few topics can be fully discussed in one place; for example, certain practical considerations on fractures and luxations are discussed in connection with the bones, certain other features with joints, certain others with muscles, and so on.

The illustrations, also, in that they are practically all drawn originally for this work, mark a distinct era in the publication of anatomical text-books in the English language. It is true that the early editions of Gray's *Anatomy* were illustrated almost entirely by original cuts; but no other anatomy can boast the wealth and variety of illustration which Dr. Piersol has presented to his readers; and when it is remembered that this variety is not obtained by the insertion of drawings copied from Spalteholz, Testut, Quain, Henle, Zuckerkandl, and other European authors, one begins to appreciate the value of the volume now before us. Dr. Piersol, in his preface, rather lays stress on the fact that his illustrations are not diagrammatic, but that they faithfully record the preparations and dissections as they actually appear; and we think the only legitimate criticism, and one which we offer with due deference to the contrary opinion of others, is that the actual appearance of even the most skilfully made dissection is less easily interpreted by the average student than is a semidiagrammatic reconstruction of the preparation, such as was furnished, for instance, by the original wood-cuts of Gray. There can be no question, however, of the superiority, from an artistic standpoint, of the illustrations in Piersol's *Anatomy*. And as ". . . . *opere in longo fas est obrepere somnum*," it will not, we hope, be considered invidious if we point out a few—a very few—lapses from the usual high standard presented by most of the illustrations. The fault to which we refer, and it is a fault which is no doubt even more apparent to the professed artist than to the casual observer, is a lack of what is known as "modelling" in certain of the illustrations (for example, in Figs. 241, 364, 598, 1630), on account of which the more distant surfaces of the dissection are made to appear to lie on the same plane with, if not even in front of, those structures which should be in the foreground. As we have said, the artists themselves, no doubt, have been the first to appreciate this peculiar appearance, which is possibly due to the process of reproduction, and which can readily be corrected when once it is observed.

The main text of the work probably affords the most scientific, accurate, comprehensive, and, for a single volume, the most exhaustive account of human anatomy to be found in the English language. Dr. Piersol, whose editorial ability has rarely been surpassed, has exercised such a judicious and tireless supervision over the articles of his collaborators, that no overlapping is to be found, no hiatuses exist, and cross references in the text are always inserted where desirable. The scientific attitude of mind which inspires him permeates the entire work. Considerable stress is laid throughout on comparative anatomy, for it is well recognized by the editor that without the knowledge of *why* a thing is thus and so, anatomy bebecomes a mere matter of memory.

Dr. Dwight draws on his rare familiarity with comparative anatomy with the happiest results in the sections devoted to the bones and joints. Much matter of an encyclopedic character is included, of utmost value to many advanced students and specialists; and it is refreshing to learn so much of morphology from an original source.

Prof. McMurrich has made a brave attempt to present a scientific classification of the muscles on a morphological or embryological basis. Owing to its novelty, it is somewhat difficult for the reader to find his way around at first, but further acquaintance will no doubt render this easier. Although Prof. McMurrich is forced to abandon his classification in certain regions, owing to the present limits of embryological knowledge, it is none the less a praiseworthy attempt to bring order out of chaos. Prof. McMurrich discountenances the view that the lymph capillaries open directly out of the so-called lymph spaces in the cellular tissues. He holds that the lymphatic system is closed, except for its connection with the subclavian veins. This view is not indorsed by the writer of the practical considerations; and the editor evidently finds it difficult to decide where doctors disagree.

That portion of the work devoted to the nervous system is particularly complete, both as regards the text (which occupies nearly 400 pages) and the illustrations. These sections are followed by descriptions of the skin and its appendages, and of the organs of special sense. The gastropulmonary system is next described, the alimentary tract, peritoneum, and practical considerations on hernia being discussed in 275 pages; while the organs of respiration are dismissed in 56. Accounts of the urogenital system, including the male and female reproductive organs, conclude the volume.

It is said that Laurembergius, professor at Rostock in the seventeenth century, boasted that he had found more than two thousand errors in the Anatomy of his rival Laurentius. We venture the assertion that it will be difficult to discover as many as two errors in the present work. It is truly a *magnum opus*; more than that, it is a *κτῆμα ἐς ἀεί*. Familiarity, instead of breeding contempt, will but enhance its value in the possessor's mind, since he will be more able

to find what he desires to know (the present index is not sufficient); as text-book, reference book, encyclopedia, it is not equalled by any single volume now in existence. A. P. C. A.

MODERN MEDICINE. ITS THEORY AND PRACTICE. In original contributions by American and foreign authors. Edited by WILLIAM OSLER, M.D., Regius Professor of Medicine in Oxford University, England. Assisted by THOMAS MCCREA, M.D., Associate Professor of Medicine and Clinical Therapeutics in Johns Hopkins University, Baltimore. In seven octavo volumes; Volume II; pp. 828; 69 illustrations. Philadelphia and New York: Lea Brothers & Co., 1907.

THE second volume of Osler's *Modern Medicine* is devoted to that large and important group of diseases known as the infections. It opens with an eminently appropriate and well written introduction to the study of infectious diseases by Ludwig Hektoen, who describes in a lucid manner the general nature and specificness of the infectious diseases, the biological characteristics of the infectious agents, the ways and means of infection, the nature of the resistance offered by the human body, and antitoxins, lysins, opsonins, precipitins, agglutinins, etc. The chapter is altogether worthy of its author, and should prove of much value to the alert general practitioner desirous of keeping abreast of the times.

Among the many infectious diseases discussed in the volume, two probably will enlist general interest—typhoid fever and pneumonia. The article on typhoid fever is by Thomas McCrae, and comprises 161 pages. It is a noteworthy contribution, reflecting not only the author's own large experience, but also that of the Johns Hopkins Hospital physicians in general, and constituting a masterly account of a disease universal in its distribution and protean in its manifestations. The discussion of the treatment is quite practical; the bath treatment, of course, is preferred; the diet suggested is restricted rather than generous (in opposition to the tendencies of some physicians); the use of large amounts of water internally is urged; and drugs are advised only for special indications; indeed, the motif of the chapter on treatment is Nathan Smith's statement, "It does not follow, of course, that the disease in all cases requires remedies, or that a patient should necessarily take medicines because he has the disease."

The article on lobar or croupous pneumonia is by John H. Musser and George W. Norris, and comprises 110 pages. It is based upon the authors' wide and varied experience and upon a careful

statistical and other study of the literature. It is comprehensive, complete, authoritative, eminently graphic in the discussion of the symptomatology, and practical in suggestions in treatment. Especial attention is devoted to the value of hydrotherapeutic measures and the rationale of their use; the importance of large amounts of water internally in combating the toxemia; the necessity of promoting elimination; the value of stimulants, when needed (the use of alcohol is commended); and the question of diet.

The account of scarlet fever and diphtheria has been contributed by John H. McCollom, than whom no one is more competent. The chapters, reflecting his experience, are authoritative and may well be looked upon as comprising all of importance that is really known of the diseases in question. It is interesting to observe that, in discussing the differential diagnosis of scarlet fever, Dr. McCollom expresses his disbelief in the existence of a so-called fourth or Duke's disease. His discussion of the treatment of diphtheria is particularly illuminating, and should be read by all practitioners; it shows well what can be accomplished by the use of antitoxin, not only in the direct cure of the disease, but in the virtual substitution of intubation for tracheotomy in the severest cases of laryngeal diphtheria, etc.

There are many other excellent contributions: On smallpox and chicken-pox, by William T. Councilman, which contains a full account of the supposed parasitic cause of the disease, an account of much interest, though not entirely convincing, by one who has devoted much time and energy to elucidating the etiological factors of the disease; on vaccination, by George Dock, which contains statistical and other matter that should be of interest to our friends the antivaccinationists, though doubtless they will disavow the convincing array of facts in favor of vaccination and revaccination; on measles, rubella, whooping-cough, and mumps, by John Ruhräh, who also expresses doubt regarding the existence of the so-called fourth disease; on influenza, by Frederick R. Lord; on dengue, by Thomas T. Coleman; on epidemic cerebrospinal meningitis, by Henry Koplik; on erysipelas, by James M. Anders; on toxemia, septicemia, and pyemia, by Richard M. Pearce; on rheumatic fever, by Frederick J. Poynton, who has done much work in regard to the supposed bacterial nature of the disease; on cholera, by W. P. Dunbar; on yellow fever, by James Carroll, whose work in elucidating the nature of the disease and its mode of transmission by the mosquito is well remembered, and whose recent death is much lamented; on plague, by W. J. Calvert; and on bacillary dysentery, by K. Shiga, the pioneer in proving the bacillary nature of one form of dysentery.

The volume is a worthy member of an excellent family, and is to be unreservedly commended. A. K.

THE PRACTICE OF OBSTETRICS BY AMERICAN AUTHORS. Edited by CHARLES JEWETT, M.D., Professor of Obstetrics and Gynecology in the Long Island College Hospital, New York. Third edition. Pp. 820; 484 illustrations. New York and Philadelphia: Lea Brothers & Co., 1907.

IN the space at our disposal an extended review of this book is impossible, and as the profession has already given a favorable verdict to the two earlier editions, it indeed is unnecessary. The present volume is well balanced, and while there are opinions expressed in one portion only to be contradicted in other parts of the work, we are glad to say that this defect is not glaring. Of course, we find certain teachings with which we are not in accord. This is unavoidable, and, moreover, with but few exceptions, our differences are dependent upon the individual viewpoint, the result of personal experience, and are, therefore, unsuitable for discussion here.

We are pleased with the conciseness of expression and the general definiteness of the teaching given, and we note with pleasure that, while the book is sufficiently illustrated, it is not weighted down with useless pictures. We heartily congratulate the authors upon the inclusion of a fair amount of bibliography, an item which greatly enhances the value of a volume upon a scientific subject. While we have been impressed with the uniform excellence of the work as a whole, both in its scope and in the detail of its execution, there are several portions which have especially appealed to us, among others the section devoted to extra-uterine pregnancy, which includes a suitable consideration of the advanced case; the pages given to the toxemias of pregnancy; the section upon the diagnosis of pregnancy, which is most satisfactory in its completeness; and the very excellent twenty pages devoted to fœtal anomalies—a scientific presentation of the greatest value.

We profess an opposition to systems of medicine, believing the book written by one man of ripe experience to be preferable; but, if a composite book is desired, we can recommend the one before us, since we consider it to be the best yet published. W. R. N.

THE DIAGNOSIS AND TREATMENT OF DISEASES OF WOMEN. By HARRY STURGEON CROSSEN, M.D., Clinical Professor of Gynecology, Washington University, St. Louis, Mo. Pp. 800; 700 illustrations. St. Louis: C. V. Mosby Medical Book and Publishing Company, 1907.

OUR first impression of this book, gained from its title and the large number of illustrations, was distinctly unfavorable. We have

previously inveighed against the picture-book method of teaching gynecology, and we are not enthusiastic with regard to the value of a book limited to the consideration of diagnosis and treatment; but it gives us pleasure to recant from our position in so far as the present volume is concerned, and to make amends by heartily recommending it. As implied in the title, the only subjects considered are the diagnosis and treatment of gynecological affections. Our only criticism is that we believe the value of the work would have been greatly increased by including pathology as well. Aside from this we have nothing but praise for the painstaking work of the author. The greater portion of the 700 illustrations have been obtained from the works of other writers, to whom full credit is given. The text is concise, but sufficient for its purpose. Major operative procedures are considered only in a subsidiary manner, while the procedures required of the general medical attendant are carefully described. We believe that the book will meet with a favorable reception, filling as it does a vacant niche in the library of the general practitioner. W. R. N.

THE HYGIENE OF NERVES AND MIND IN HEALTH AND DISEASE. By AUGUST FOREL, M.D. Authorized translation from the second German edition by HERBERT AUSTIN AIKINS, PH.D. Pp. 343. New York and London: G. P. Putnam's Sons, 1907.

THIS is another volume of the *Science Series* and is supposed to be an exposition of the hygienic conditions in relation to the nervous system. In the preface it is stated that for such a task as this Prof. Forel has very unusual qualifications, for as a psychologist, especially in the field of instinct and hypnotism, he has a world-wide reputation. This is unquestionably true, and therefore the more surprising that he should write a book of this sort, which can in no way be any credit to him. It is rather difficult to understand how any layman, for evidently the book has been written for laymen, can understand its contents. It is subdivided into three parts: In the first are discussed the mind, brain, and nerves in the normal condition. In this are included five chapters, the total making one hundred and thirty-nine pages. Here are discussed psychology (the science of the mind), the anatomy of the nervous system, the relation of the mind to the brain, the physiology and the embryology, and the race history of the nervous system. The second part includes the pathology of the nervous life, and encompassed in about one hundred pages are discussed the general conceptions of nerves and mental pathology, the synopsis of mental and nervous diseases or abnormalities, and the causes of mental and nervous disturbances. The third part is devoted to the hygiene of mental life and of the nervous

system, to which the rest of the book is dedicated. In this part are treated nervous hygiene in general, the nervous hygiene of inheritance, the nervous hygiene of development or of childhood, and, lastly, that of adults.

One can readily appreciate that in a book whose object is to expose the principles of the hygiene of nervous diseases it is hardly necessary to discuss the relation of the mind to the brain or to know what are spirit and mind. It is rather questionable whether a knowledge of the general conceptions of the pathology of the nervous system may be of benefit. The trouble with books like these is that they fall into the hands of people who are hardly prepared to read and digest the contents with any comprehension, and the general result is that they do more harm than good. It is, of course, true that the public at large has very little conception of the character of nervous and mental diseases, and it would be an excellent thing if the public could be taught that the presence of insanity in a family is not a source of degradation. This book, however, will not accomplish this. So far as hygiene is concerned it is hardly necessary to have a special form for the nervous system, since hygiene is not as yet to be divided into specialties. T. H. W.

Ophthalmia Neonatorum, with Especial Reference to its Causation and Prevention. (The Middlemore Prize Essay of the British Medical Association, 1907.) By Sydney Stephenson, M.B., C.M., Ophthalmic Surgeon to Queen Charlotte's Hospital, London. London: The Ophthalmoscope Press, George Putnam & Sons, Limited, 1907.

This is an excellent monograph, exhaustive, judicious, and interesting, upon the most important disease in the whole realm of ophthalmology. The author develops the subject upon the following general lines: Neisser's discovery of the gonococcus has placed this disease and allied affections upon a thoroughly scientific basis. That a connection existed between fluor albus in the mother and ophthalmia in the child was recognized by some as early as the middle of the 18th century. It is now known that the discharge from the eyes contains gonococci in from 50 to 66 per cent. A milder type of inflammation occurs without the latter organism, but associated with several other kinds of pyogenic germs (pneumococcus, staphylococcus, streptococcus, bacterium coli, etc.); sometimes micrococci are altogether absent. Both eyes are attacked, as a rule. But the author's own experience, as well as that of others quoted, shows that it is not so rarely limited to one eye as is frequently stated. Arthritis is an important septic complication; serous mem-

branês are rarely affected, even general sepsis ending fatally has been observed. "Billard's sign" that is, a narrow transverse red line in the centre of the upper lid, is stated to mark the first beginning of the ophthalmia.

The affection must be distinguished from lacrymal disease and keratomalacia. Microscopic examination of the pus, the author thinks, should never be omitted. The author by no means shares the optimism contained in the opinion that a good prognosis is always justified if the cornea be clear when the baby comes under medical care. Gibson, who recognized the connection between the maternal disease and ophthalmia in 1807, gave directions for prevention which cannot be bettered at the present day. Credé's method is unequivocally endorsed (1 per cent. solution of silver) and the objections to it are correctly pronounced unimportant, but notification, instruction of students and midwives, education of the public, etc., should not be omitted.

In the treatment of the disease the author does not depart from generally recognized principles, such as the destruction of the gonococci locally, particularly by the salts of silver and the proper removal of the discharge by a non-irritating fluid. T. B. S.

THE REVIEW OF THE AMERICAN PRACTICE OF SURGERY, Vol. II, PUBLISHED IN THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES, September, 1907, Vol. CXXXIV, p. 427.

MY attention has recently been called to the statement in the above mentioned review that my "descriptions of traumatic or emphysematous gangrene and of hospital gangrene are particularly graphic. Perhaps this is to be attributed to the fact that they are taken bodily, with little verbal change, and with no credit, from the pages of Ashhurst's *Surgery*." This has led me carefully to re-read and compare my article with those of Professor Ashhurst on the same subjects. I find that in 101 pages—almost 4000 lines—covered by my article on "Gangrene and Gangrenous Diseases," I have used in regard to the two subjects alluded to (occupying ten and a half pages), 61 lines taken from Ashhurst's *Surgery*, and elsewhere in my article 36 additional lines, most of them somewhat changed verbally but still obviously derived from that source.

While surgery is a progressive science, there is much that, although it is necessary to mention it in a comprehensive article, has become classical rather than practical, and especially is this true of virtually extinct diseases like hospital gangrene, for the facts concerning which we of the younger generation must turn to the writings of our teachers and of their teachers. I regret that in doing this—as the verbal

changes often precluded the use of quotation marks—I did not at least put "(Ashhurst)" at the end of such paragraphs as I owed to him.

I believe a careful search through and comparison between the writings of many authors, of much more distinction than I am likely to attain, would show, throughout the history of medical literature, a tacitly accepted custom of employing certain forms of expression to describe conditions unchanging through the years, and, to one unpossessed of great literary ability, difficult of characterization in absolutely new or original language.

The late Professor Ashhurst, my former teacher and one of the leaders of his profession, was a man of great punctiliousness and accuracy. No one would accuse him of plagiarism or of doing what was not in accordance with the highest sense of professional honor, yet having been led by the reviewer's mention of his name in this connection to compare his surgery with that of Mr. Erichsen, previously published, I find that he made very similar use of the writings of his predecessor on these same subjects, as appears by Erichsen (third edition, 1861), pp. 107, 108, 394, 395, and Ashhurst (fifth edition, 1889), pp. 155, 156, 433, 434, and many other pages. The resemblance, both as to words and lines of thought, is often very close. Professor Ashhurst also followed with equal closeness the plan, headings, divisions, subdivisions, and teachings of his distinguished English predecessor. Neither on these pages nor in the preface—of the fifth edition at least—is any acknowledgment of indebtedness to Mr. Erichsen to be found.

The reviewer's thought that "my personal experience with gangrene appears to have been confined to a single case" might occur to a casual reader, but he is well aware that I have been connected with several large Philadelphia hospitals for many years, and he also knows that, therefore, I have had the opportunity of observing many cases of such varieties of gangrene as are still to be seen. He further states that I make this case "do duty, (1) as gangrene due to arteriosclerosis (p. 214); (2) as diabetic gangrene (Plate XII); and (3) as emphysematous gangrene (p. 252)." The description which is on the page opposite the illustration of this case shows that it well exemplified the three conditions. It might have been called any one of the three forms, but, as a matter of fact, it is shown merely as a case of "gangrene of the foot," and it corroborates forcibly the claim made throughout the article that in the great majority of instances gangrene depends not upon a single cause, but upon the simultaneous action of two or more pathological conditions. A multiplication of such expensive color plates could not possibly have brought out so well the interdependence of these conditions, and could have given no better pictorial representation of them. The same underlying fact—of intimate correlation as to causes—explains the "repetitions" of which he complains. Any description

of diabetic gangrene without free reference to the subject of arterial sclerosis or atheroma would be incomplete; similarly, any discussion of senile gangrene without reference to the prominent part played by traumatisms, even though slight, local lesions, etc., would be valueless.

In offering the foregoing, I have endeavored to avoid the appearance of controversy, by omitting reference to all matter of opinion, and by confining myself entirely to facts that any reader may verify for himself.

ALFRED C. WOOD.

I have read the foregoing communication from Dr. A. C. Wood. When writing the review, I carefully considered my words; and having again referred to the notes made at that time, I am willing to let the review stand as published. In regard to the suggested resemblances between Ashhurst's *Surgery* and that of Erichsen, it should be well known that, having published an American edition of Erichsen in 1869, Professor Ashhurst, when publishing his own *Surgery* in 1871, cordially acknowledged in the preface his indebtedness to the distinguished British surgeon for both the plan and many of the details of his own work.

A. P. C. A.

I have read the reviewer's reply to my communication. I confined myself to facts, none of which he contradicts; and I employed neither the *suggestio falsi* nor the *suppressio veri*. I used Professor Ashhurst's name (introduced into the review by the reviewer) to illustrate, and to justify, a custom which I believe to be not uncommon. I limited myself to the edition of Ashhurst's *Surgery* under my hand, which was sufficient for the purpose. I might have included the second (1878), third (1882), fourth (1885), and sixth (1893) editions, but desired to avoid even the appearance of unkindly criticism. I repeat now that the custom in question seems to me compatible with high standards of professional honor, and I have no intention of "suggesting" anything else.

ALFRED C. WOOD.

PROGRESS

OF

MEDICAL SCIENCE.

MEDICINE.

UNDER THE CHARGE OF

WILLIAM OSLER, M.D.,

REGIUS PROFESSOR OF MEDICINE, OXFORD UNIVERSITY, ENGLAND,

AND

W. S. THAYER, M.D.,

PROFESSOR OF CLINICAL MEDICINE, JOHNS HOPKINS UNIVERSITY, BALTIMORE, MARYLAND.

Pulmonary Tuberculosis and Induced Abortion.—Von Amstel (*Beiträge zur Klinik der Tuberkulose*, 1907, vii, 79) has collated a most profuse array of opinions bearing upon the influence of pregnancy, and labor, on the course of pulmonary tuberculosis, and the advisability of producing abortion. The article really consists of quotation heaped on quotation and is valuable through the grouping of an almost endless number of views upon this important subject. He points out, to begin with, that the laws of most countries make abortion punishable, without defining any exceptions. Jurists assure him that it would, of course, be impossible to convict a physician who performed an abortion to save the life of the mother, but the technical plea must resort to the unwritten law or to casuistic juggling of the statutes. One cannot be guaranteed immunity from an unsavory prosecution. In some countries, however, as in certain cantons of Switzerland, qualifying clauses are appended, "to prevent a greater evil to save the life of the mother," etc. Treub has urged that the law be sensibly modified or entirely stricken out. Unfortunately, even medical opinion varies widely as to the exact indications for abortion, and the attempt to arrive at some standard by instituting regulating boards has been unavailing. Medical men must decide a given case according to their own consciences, although the advice always given and usually followed is to have a consultant, not so much from a desire to have a partner in responsibility as to have additional light thrown upon an important matter. To show how widely apart honest opinions may stand, they point to Maragliano, who considers the presence of tuberculosis in the mother an absolute indication for the production of an abortion, and Pinard, who would allow an abortion only when the pregnancy itself is the menace to life, and advises to nurse the tuberculous patient carefully and allow the pregnancy to take

its course. There are many moot questions which come up for consideration in a discussion of abortion in pulmonary tuberculosis.

In regard to the progeny, they are probably, as a rule, born free from tuberculosis. While germinal infection may be possible, and placental infection very frequently does occur, Baumgartner, alone of prominent writers, ascribes any very great importance to congenital tuberculosis. Numerous statistics show, however, that only a small number of children of tuberculous mothers reach puberty, most dying in the first few years of life. The prevailing opinion is that postnatal and not antenatal infection plays the prominent role. There is at present a strong French school, prominent in which is Landouzy, which is insistently urging the view that tuberculous antecedents are an important factor in the production of various hereditary malformations, laying especial emphasis upon the frailty and lack of resistance of children of the tuberculous. At any rate, it may be confidently asserted that such children are less likely to reach adult age. As regards the mother, it is now universally admitted that pregnancy exercises a most baneful influence upon the course of pulmonary tuberculosis, and statistics, as well as general experience, show that in cases in which abortion is performed, particularly when performed early, the course is much more favorable. Labor and the puerperium are times of even greater danger than pregnancy itself. It is a matter of universal comment how frequently a quiescent or unsuspected lesion will become active and rapidly spread during pregnancy or the puerperium. It is astonishing how many tuberculous women date their illness from childbirth.

It would not be possible even to indicate the various views which prevail as to the advisability of producing abortion in tuberculosis. The medical principles are clear, and the discussion revolves about the relative rights of the mother and the child. The two extreme views have been quoted. Some would perform abortion only in early cases in which there is a prospect of ultimate arrest. Others would wait until it became evident that the pregnancy was injuring the mother; others, until the child is viable. However, to put off the operation until so late a time would defeat the object for which it is undertaken. Von Amstel's conclusions in summing up his considerations are these: If the tuberculous woman wishes to marry, she should be warned of the danger and advised against it. If she is married, facultative sterility should be practised. If she is pregnant, the dangers of her condition should be explained and abortion urged. The earlier and more favorable the tuberculous lesion, the more positive the indication. The only exception he makes is in far advanced cases in which the operation can be of no possible good to the mother.

The Interpretation of the Positive Venous Pulse.—A. W. HEWLETT (*Jour. Medical Research*, 1907, xvii, 119) observes that: (1) A positive wave of the venous pulse during ventricular systole may be due to at least three different causes: (*a*) simultaneous contraction of the auricles and ventricles; (*b*) tricuspid insufficiency; and (*c*) paralysis of the auricles. (2) Simultaneous contraction of the auricles and ventricles causes, or tends to cause, the V-wave to disappear from the tracing owing to auricular diastole. (3) Tricuspid insufficiency produces a large V-wave, which appears abnormally early. In marked cases there is a gradual

ascent in a tracing from the auricular wave to the summit of the V-wave. (4) In absolutely irregular pulses the auricles have ceased to contract. The positive venous wave of early ventricular systole is produced by the contraction of the ventricle, and is transmitted unchanged through the motionless right auricle to the veins of the neck. Normally, this wave is taken up by the dilating auricle. (5) Tricuspid insufficiency does not necessarily accompany auricular paralysis, and when it does so its diagnosis is difficult, for the reason that in both conditions the V-wave appears early, owing to the excess of blood in the right auricle.

Method of Measuring the Venous Pressure without a Manometer.—GEORGE OLIVER (*Quarterly Med. Jour.*, 1907, i, 59) notes that "if the veins on the dorsum of the hand are sufficiently visible, it is found that when the hand is held in a vertical position, with the fingers extended, and is very gradually raised, the veins at a certain height above the level of the apex of the heart are seen to collapse quite suddenly. The completion of the process is quite definite, for the transition from a partial to a complete collapse takes place within the space of a half-inch." At the moment of collapse the blood pressure within them (the veins) is nil, being balanced by the force of gravity. We may therefore express this force, annulling the hydrostatic rise of blood in mm. of Hg. In calculating results we multiply by 2 (or approximately the number of mm. of Hg representing the pressure in one inch of blood) the number of inches above the level of the apex of the heart at which the veins collapse, thus ascertaining in mm. of Hg the venous pressure. Oliver says that this method has afforded him excellent results, it being important to see that the pressure is not artificially raised, as by nervousness, obstruction by tight clothing, or touching the forearm, or lowered by the affects of cold.

The Pathogenesis of Pernicious Anemia with Particular Reference to Bothriocephalus Anemia.—TALLQVIST (*Ztschr. f. klin. Med.*, 1907, lxi, 427).—The etiology of pernicious anemia is still unknown. Its definition depends upon a blood picture which is itself not distinctive, but occurs as a secondary feature in the course of other diseases. Chief among these are certain parasitic infections of the intestines. A thorough understanding then of the conditions under which they produce the blood changes of pernicious anemia may give valuable suggestions as to the origin of the disease. Passing the exhaustive review of the literature with which Tallqvist introduces his article, we begin at once with a brief report of his interesting experiments with Bothriocephalus latus. Infection with this worm is exceedingly common in Finland, yet relatively few of its hosts develop severe anemia. The coincidental view advanced by Bloch is rejected as an inadequate explanation, and the object of the experiments is to find under what conditions the anemia is produced. In a study of the worms it is found that when fresh specimens are extracted with water or sodium chloride solution the filtrate has no effect upon blood. When, however, the segments are macerated, the resulting mixture displays very pronounced hemolytic and hemagglutinating properties, and contains, besides, a proteolytic ferment and a substance restricting the action of pepsin and tyrosin. When the segments are placed in water they rapidly disintegrate and become dissolved, forming

an emulsion-like mixture. This action occurs independently of bacteria and depends upon an inherent autolytic action. When such an emulsion is filtered the hemolytic substance remains entirely in the mass, while the agglutinin and the ferment pass entirely through with the filtrate. These two latter substances cannot be definitely separated, but, under varying conditions, one may be preserved and the other destroyed, showing their independence.

The hemolytic substance is insoluble in water or sodium chloride solution. It may be extracted and dissolved in alcohol and ether, and presents other fat-like properties. This lipoid substance is closely united to the albuminous portion of the worm, and its full effect is exercised only when set free by disintegration of the proteid by digestion. Under these conditions it is as active as the alcohol or ether extract. The substance produces no antibodies. Hemolysis proceeds without hemoglobin destruction. Red blood corpuscles from all sources are affected, but the intensity of this action varies widely. Rabbits, guinea-pigs, man, dogs, horses, cattle, goats, chickens, and pigeons are arranged in the order of their susceptibility. The hemolytic action is quite marked. For example, 8 cm. of a 2 per cent. suspension of horses' red corpuscles shows complete hemolysis with 0.001 gram of the substance. Extraction and weighing show that the lipoid substance forms about $\frac{1}{10}$ of the dried mass of the worm. All experiments indicate that it is an integral part of the worm body and not a secretion.

The hemagglutinin likewise forms an integral part of the worm body. It is soluble in water and is thermolabile. When once destroyed by heat it cannot be reactivated by the addition of complement. The agglutinin has a strong affinity for certain red blood corpuscles. Corpuscles from the horse, for instance, combine fifty times the lowest active amount. The agglutinated corpuscles become much less resistant to mechanical influences. The substance is not uniformly active, corpuscles from many animals being unaffected. The most sensitive to its action are human red blood corpuscles. The agglutinin forms an antibody when injected into animals. It is easily destroyed by acids and by pepsin and trypsin digestion. It displays no agglutinating action toward bacteria. The enzyme is a proteolytic ferment, very labile, and cannot be preserved for any length of time, making its examination difficult. It works most actively at a temperature between 35° and 40°, and is destroyed at 60° C. It is soluble in water, and acts best in a slightly acid medium. It dissolves coagulated egg albumin and muscle and liquefies gelatin. The filtrate, as was said, shows an inhibiting action on pepsin and trypsin. This action is strongest the shorter the time the animal has been dead. At 100° C. the inhibiting action is much reduced but not entirely lost. This antifermentative substance is quite distinct from the autolytic substance. Examination of worms coming from cases of severe anemia shows that these contain the same substances that are found in worms from other sources, and no new specific product can be found. What is striking about the worms from anemic cases is their small size and the evidences of marked disintegration. The dried material per given length is also much reduced. The procentual relation of the various substances remains the same, but the lipoid substance seems freer and unites more easily with the red blood corpuscles. This suggests that in cases with anemia some factor occurs

leading to death of the worm, and that by autodigestion the lipoid substance becomes more easily absorbable. Tæniæ show neither an agglutinin nor a hemolytic substance. Experiments with the sera of various animals show that they all contain, in varying degrees, a certain inhibitory action upon the hemolytic substance and upon the agglutinin and ferment. This reaction Tallqvist thinks is more probably a physical than a chemical one. Animal experiments with these various substances give the following results: Intraperitoneal injection of the self-digested worm substance *in toto* causes definite anemia and marked constitutional symptoms in rabbits. The albuminous agglutinating substance injected alone causes the same grave toxic symptoms, but only a transient anemia. When the agglutinin is administered by mouth there is absolutely no reaction. It is probable that it is not absorbed from the intestinal canal of patients with bothriocephalus, as their serum fails to show the presence of any antibody. This seems to exclude it as the important factor in the production of the anemia. The lipoid substance injected intravenously causes anemia and has a toxic action which bears a distinct relation to its action upon the red corpuscles. Subcutaneous injections and administration of small doses frequently repeated produce a definite anemia which has many of the characters observed in cases of pernicious anemia. The hemoglobin is relatively high, the number of leukocytes is decreased, and there is a relative lymphocytosis. Nucleated red cells appear as well as microcytes and macrocytes. There is poikilocytosis and marked polychromatophilia. The anemia, too, shows a decidely remittent course, and at autopsy there is siderosis of the liver and spleen and lymphoid metaplasia of the marrow.

After this exhaustive study of the properties of the substance of the bothriocephalus, Tallqvist applies his observation to the interpretation of primary anemias. Numerous observers have demonstrated the presence of hemolytic substances similar in action to the lipoid material of bothriocephalus in many normal organs, particularly in the mucous membrane of the digestive tract and in some of its glands. The almost constant presence of grave changes in the digestive tract in primary anemia leads him to suggest that certain quantitative and qualitative changes in fat conversion may exist, perhaps a pathologically increased excretion of the hemolytic lipoid substance, which acts as the toxic agent. Similar substances have been described, too, in malignant tumors, and may be the cause of the accompanying anemia, particularly of the intense anemia so frequently associated with gastric cancer.

The Histopathological Diagnosis of Affections of the Liver and Spleen.—F. SCHUPFER (*Semaine médicale*, 1907, xxvii, 229).—It is difficult in many instances to determine the exact condition of the liver and spleen by direct clinical methods. Schupfer accordingly proposes puncture by a small hollow needle or trocar and examination of the small piece of tissue obtained. This exploratory puncture was first proposed in 1895 by Lucatello. The possible traumatism caused by the earlier methods of puncture led Lucatello to devise a newer form of needle and method of extraction of the bits of tissue. The needle is 8 cm. in length with an exterior diameter of 1.8 to 2 mm. and an interior dia-

meter of 1.4 to 1.5 mm. The tip is cut slanting and the walls taper to a fine cut edge. A small glass syringe is attached to the needle, and during the withdrawal of it mild aspiration is practised by the syringe, this facilitating the extraction of plugs of tissue which are about 1 mm. in width and 1 to 2 cm. in length, a size sufficient for pathological study. Complete sterilization is most important, and the needle should be perfectly dry, as tissue adheres better under these circumstances than when the interior of the needle is moist. Methods of preparing the tissue for study are given by the author, who has by means of this puncture been unable to differentiate many conditions in the liver and spleen. The diagnosis of different forms of cirrhosis, the differentiation of lesions from primary tumors of the liver and spleen, or from malignant metastases, are examples of the assistance which this method has afforded him. Liver abscess is frequently diagnosticated, while in Banti's disease the needle allows inspection of the hepatic condition when the advisability of splenectomy is under consideration, as well as the ultimate result after the removal of the spleen. It can be used in tumors elsewhere than in the liver and spleen, though in these conditions the situation of the tumor and other circumstances may contraindicate puncture.

(The reviewer would warn against the use of these methods in large, soft, hyperplastic spleens. The danger of fatal hemorrhage as a result of exploratory aspiration of acute splenic tumor has more than once been demonstrated.—W. S. T.)

Roentgen-ray Treatment of Syringomyelia. — E. BEAUJARD and J. LHERMITTE (*Semaine médicale*, 1907, xxvii, 193) say that former measures in the treatment of this serious condition have only been palliative and for the relief of symptoms. The causal lesion has entirely escaped benefit, a fatal termination coming on inevitably. But recently the employment of the *x*-rays has completely modified this bad outlook and changed considerably the clinical history. The authors' 4 cases and 6 others reported from the literature form the basis of this article. One case especially was followed carefully throughout the entire course of the disease, and in this treatment showed the most remarkable results. The treatment started in May, 1906, with weekly applications of the *x*-rays to the spine (the dose was 3 H. units, of 7 to 9 penetrating power, and the tube held 15 cm. from the skin). Altogether 26 exposures were given, with occasional remissions to avoid a dermatitis. Even from the third treatment a marked amelioration of the sensory symptoms was noted, and there was steady improvement until complete recovery. The rays were applied to each side of the median line, thus covering the cord most thoroughly. A study of the sensory disturbances would indicate the exact region of the spine which requires treatment, but the sound regions should be included also. Parts not treated or those to be treated later he thinks should be protected. The motor disturbances seem to be influenced first, and later the muscular strength gradually returns. Finally, the trophic disturbances disappear and the restoration of the sensations of heat, contact, and pain follows. Advanced muscular atrophy is little affected, but beginning atrophy and weakness are markedly influenced.

SURGERY.

UNDER THE CHARGE OF

J. WILLIAM WHITE, M.D.,

JOHN RHEA BARTON PROFESSOR OF SURGERY IN THE UNIVERSITY OF PENNSYLVANIA; SURGEON TO THE UNIVERSITY HOSPITAL,

AND

T. TURNER THOMAS, M.D.,

ASSISTANT SURGEON TO THE UNIVERSITY AND THE PHILADELPHIA GENERAL HOSPITALS, AND INSTRUCTOR IN SURGERY IN THE UNIVERSITY OF PENNSYLVANIA.

Late Secondary Nephritis.—LEVY-FRANCKEL (*Annales des maladies des organes genito-urinaires*, 1907, xxv, 1392) says that the recognized varieties of syphilitic nephritis are: (1) An acute form occurring in the second stage, characterized by an enormous albuminuria (20 to 50 grams or more in twenty-four hours), and by its appearance during the full efflorescence of the secondary symptoms; and (2) a tertiary nephritis, rarely acute, more frequently an interstitial nephritis, occurring ten, twenty, or thirty years after the chancre. Often this is accompanied by tertiary symptoms. Besides these there is a somewhat special form, distinguished from the acute secondary by its evolution and symptoms, and from the tertiary by its time of appearance in the course of syphilis. It shows some special characteristics. It does not coincide with the appearance of the secondary symptoms. In contrast with the precocious form, the quantity of albumin is relatively small and does not generally reach 8 grams in the twenty-four hours. It appears from two to three years after the chancre. Another special characteristic is the insufficiency of milk diet and diuretic treatment. The symptoms persist and are aggravated under this *regime*, and yield only to mercury or mercurial iodide. This treatment seems to act with remarkable activity. In one case, after six injections of 2 c.c. of benzoate of mercury, the ascites ceased to be reformed. The difficulty in diagnosis is to be accounted for chiefly by the fact that as the symptoms occur after the cutaneous manifestations of syphilis and at times in the course of ignored syphilis, one does not think of the specificity of the affection.

Actinomycosis of the Appendix.—SHORT (*Lancet*, 1907, ii, 760) says that actinomycosis of the vermiform appendix was first recognized by Barth in 1890, and was first recognized in England in 1892 by Ransom. Since attention has been directed to actinomycosis in the right iliac fossa it has become evident that a number of cases really originate in the cecum, and an identical clinical picture may result after perforation. Hence a preferable title would be "actinomycotic perityphlitis." Three cases have come under Short's care in the last year, and he describes three more from the annals of the Bristol Royal Infirmary. Grill mentions 77 cases of actinomycotic perityphlitis as recorded up to 1895. In 1904, Löwe, of Greifswald, referred to 68 cases, but as he gives the names of only a few of the

original publishers, it is impossible to say how many are included in both lists. Short has found 27 cases described since Löwe's paper, so it is probable that the total number is about 150, of which 27 are English. It is highly improbable that the nature of the disease will be realized unless search is made for the granules, and even then they are frequently absent from fecal or chronic sinuses in undoubted cases. The proportion as to the sexes is about 5 males to 2 females. It is more frequently seen between twenty and thirty years of age. A large number of the sufferers are connected in some way with farm life or deal with corn. Hinglais describes the symptoms as occurring in four stages: (1) The initial stage of visceral manifestations, consisting of vague pains in the right iliac fossa, sometimes associated with intractable diarrhœa; (2) the stage of tumor formation; (3) the stage of fistula formation, usually lasting for months; subphrenic or pulmonary abscesses form and the patient dies of hectic fever and exhaustion. In some cases, however, there is (4) a stage of cicatrization, in which the fistula closes and a cure follows. Unhappily this is often only temporary. More than two-thirds of the subjects die, and even those reported cured are liable to a relapse. The disease is usually miserably chronic and may last for years. If possible the cecum and neighboring bowel should be sacrificed for a thorough removal of the disease. Usually all that can be done is to open abscesses as they point, and to give internal remedies, as potassium iodide, etc.

A Case of Catarrhal Appendicitis due to the Presence of Oxyuris Vermicularis.—Garrod and Fairbanks (*Lancet*, 1907, ii, 772), on opening the appendix in a case of supposed appendicitis, found some soft fecal matter and several thread worms. Thirty-six hours after operation the temperature was normal, but on the fourth day the temperature rose to 103.8°, and the child had an attack similar to that before operation. This lasted three days and was followed by uninterrupted recovery, the wound healing by first intention.

Novocain as a Lumbar Spinal Anesthetic.—Füster (*Deut. Ztschr. f. Chir.*, 1907, xc, 225) says that novocain employed in a dose of 0.1 gram is decidedly more analgesic than tropacocain. It is at the same time less poisonous, and, therefore, gives fewer dangerous symptoms and sequels. Failure occurs in about the same proportion with both preparations. The percentage of failures may be reduced by more careful attention to the indications for its use, especially with reference to the age of the patients. Although perfection has not yet been attained even with novocain, without doubt this preparation gives such good results that it more nearly than tropacocain concurs in efficiency with the inhalation methods. With more careful selection of cases and more strict observation of the contraindications (under fifteen years of age, suppurative processes, and marked general cachexia) we possess in novocain an almost harmless preparation. Füster recommends the drug, exclusively, in the form of tablets, and in no case the solution.

Bone Transplantation in Extensive Defects of Continuity in Long Bones.—Tomita (*Deut. Ztschr. f. Chir.*, 1907, xc, 247) says that autoplastic

and homoplastic methods are suitable to the filling in of extensive defects in continuity of the long bones. In removing a piece of bone for transplantation its periosteum and medulla should be saved. It should be large enough and should be fixed carefully in place. The cicatricial connective tissue should be excised as completely as possible. A sharp separation, therefore, is important, so that no bruising of the tissue may occur. Hemorrhage must be completely stopped. The skin wound should be closed, or only a small part should be left open for the introduction of gauze drainage for a few days. An intact large piece of bone taken from the same individual retains its viability so long that it consolidates well with the fragment. Animal bone, even the periosteum itself, shows no outgrowths and appears to aid little in the formation of callus from the ends of the fragments. The periosteum on a piece of bone taken from the same individual adheres quickly to the soft parts. A fresh piece of bone, whether it is taken from the same individual or from an animal, heals well even if it is rather large. When the healing of the wound is disturbed, a piece of bone taken from the same individual will still occasionally possess the ability to take hold after being repelled by partial necrosis. The transplanted piece of animal bone in the human body must naturally die and be absorbed, because foreign bone cells as such cannot live. But living bone-connective tissue heals in the human body better than dead bone and soon gives a solid support. This is gradually replaced by human bone through callus formation.

Separation of the Acetabular Epiphysis of the Femur: Its Relation to Adolescent Coxa Vara.—SARGENT and KISCH (*Lancet*, 1907, ii, 14) says that separation of the acetabular epiphysis is now regarded as of not infrequent occurrence, and that it is usually diagnosticated by the skiagraph. He says further that the view has been gradually adopted that all cases of adolescent coxa vara have had a previous separation of the epiphysis. A peculiarity of the case here reported is that it presents a condition of recent separation of the right acetabular epiphysis without any knowledge on the part of the patient that there was anything wrong with the right hip joint. The patient is an epileptic, nineteen years old. He said that he had a fit in bed, and when he woke the next morning his left hip was painful and he was unable to walk properly. On more careful inquiry, it was found that he had fallen out of bed in a fit about a year ago, and some time later he found that his hip was not quite right, and he was told that he limped. He has never had any sensation or pain in the right hip. On examination there were physical signs of coxa vara in the left hip, but not in the right. Skiagrams show separation of both upper epiphyses, more marked on the right side. During the last six years 10 cases with the diagnosis of "separated acetabular epiphysis" have been admitted to St. Thomas' Hospital. It is believed that traumatic coxa vara and ordinary adolescent coxa vara, that is, all cases of adolescent coxa vara, are due to a previous separation of the epiphysis.

Two Cases of Intermittent Hydronephrosis Treated by Operation.—CHEYNE (*Lancet*, 1907, ii, 11) reports 1 case, in which the cause was a high insertion of the ureter into the pelvis of the kidney. This resulted in a valve-like closure of the opening as the pelvis filled with urine. An

incision was made into the pelvis of the kidney about one-half inch to one side of the ureter and extending upward around it, and the state of the interior of the pelvis was investigated. The orifice of the ureter was then slit together with the adjacent wall of the pelvis as far downward as they were adherent to each other, thus increasing the orifice of the ureter. As this did not give the desired result, the original incision in the wall of the pelvis was continued around the ureter at about one-half inch from the ureter, or slightly less in the lower portion, so that the ureter was detached with an oval portion of the pelvic wall. An opening was then made in the lower part of the pelvis, and the ureter with the detached pelvic wall was inserted and sutured into this opening, the mucous membrane being avoided by the sutures. Some of the redundant pelvic wall at the upper part was cut away, and the edges being inverted the pelvis was closed by catgut sutures. The results of this operation were, that the orifice of the ureter was attached to the lower part of the pelvis, its opening was enlarged and no longer valvular, and there was a direct flow of urine from the pelvis to the ureter. The later progress of the case was uneventful. In the second case, the same condition was found at operation and the same procedure was carried out. Twelve days after the operation, however, during violent movements in bed, some part of the union between the pelvis and ureter must have given way, with leakage of urine into the loin. This was evacuated by incision. A month later the flow of urine from the wound had ceased and the drainage tube was left out. Two weeks afterward the patient left the hospital well.

The Prognosis and Technique of Gastro-enterostomy.—HELFERICH (*Deut. Ztschr. für Chir.*, 1907, xc, 360) calls attention to the influence which the consequent inflammation at the seat of operation may have in causing adhesions of the neighboring serous surfaces. As a result, displacement and contraction, or even occlusion, of the stomach communication with the efferent loop of intestine may occur. The symptoms of vicious circle may develop, not on account of an incorrect insertion of the intestinal opening into the stomach wound and a troublesome valve-like mechanism due to the disposition of the mesentery, but simply to closure of the efferent intestine in spite of its correct insertion. Helferich has observed several cases of this kind, but reports only one. Upon the development of symptoms of a vicious circle after a gastro-enterostomy for constriction of the pylorus by perigastric inflammation, Helferich reopened the abdomen. He found the efferent loop of intestine adherent to the colon, mesocolon, and mesentery. The adhesions were freed without any further disturbance of the anastomotic opening. In order to hinder the redevelopment of the adhesions the patient was raised to a semi-recumbent position and he was given large quantities of fluid to make the efferent loop as movable and passable as possible. Except for some disturbance in the first two days resulting from the sitting position, the patient recovered without gastric symptoms, and left the hospital seventeen days after the second operation. Helferich has made it a rule after a posterior gastro-enterostomy, before the patient is brought back to bed, to raise him somewhat in bed to overcome the pressure backward on the field of operation and to favor the normal readjustment of the intestinal coils. Later he further raises the patient toward the sitting position.

Bone Formation in the Human Penis.—FRANGENHEIM (*Deut. Ztsch. für Chir.*, 1907, xc, 480), as a result of his study of the subject says, that bone formation in the penis should not be regarded as the end result of a chronic inflammation. Sigmund observed it as a complete ossification of the lymph vessels. Others, especially the older writers, compared it with the formation of phleboliths. Waelsch considered the cord formation as a chronic phlebitis and periphlebitis, taking its origin from the dorsal vein of the penis. The plate-formed calcifications found by Robineau, and by the author compared to tracheal rings, lie, according to Waelsch, in the course of the inferior veins of the corpora cavernosa, which run in a curve around the lateral surfaces of the penis to the deep dorsal veins. Ossifications in the human penis are not remarkable when we take into consideration the fact that there is no tissue or organ in the body in which it has not occurred occasionally, and that not always in old age. So long as these facts are not explained, there is no reason to associate bone formation in the human penis with the penis bones of the lower animals.

Asthenozo-spermia, Azo-spermia, and Aspermia.—FRANK (*Ann. des maladies des organes génito-urinaires*, 1907, xxv, 1601) says that the best proof that azoöspermia and asthenozoöspermia should not be regarded as rare pathologial phenomena is found in the fact that they have been established in about 25 to 30 per cent. of cadavers. In rare cases aspermia is associated. Investigations in sterile married people have shown that azoöspermia exists in from 30 to 70 per cent. This is due in most cases to gonorrheal involvement and occlusion of the spermatic duct. The usual seat of trouble is in the tail of the epididymis. It has been shown by recorded cases and experiments on the lower animals that, in spite of such obstruction, the specific activity of the testicles is not interrupted. After ligature or resection of the spermatic duct in the lower animals, as dogs, the animals showed normal sexual excitement and performed coitus like others not so treated. After removal of the testicles, however, the sexual instinct rapidly diminished. The products of testicular activity in a short time are absorbed, and thus the vitality of the organ is preserved. This explains why after years none of the phenomena consecutive to the loss of both testicles manifest themselves. Fürbringer says that in double gonorrhœal epididymitis the chances are 9 to 1 that azoöspermia will be present. It is difficult to find in the literature statistics on the frequency of epididymitis in gonorrhœa. Finger found epididymitis 211 times in 3136 cases of gonorrhœa. Of 344 cases of epididymitis found in the literature there was azoöspermia in 302. Simmonds concluded that a third of the cases of sterile marriages are caused by azoöspermia consecutive to gonorrhœa. Gonorrhœal infections of the prostate or seminal vesicles can produce a similar result, the spermatozoids being destroyed by the action of the pus. Oligozoöspermia results from a partial destruction of the spermatozoids and asthenospermia from the resulting lowered vitality of the living spermatozoids. The small canals of the tail of the epididymis have been shown to contain cylindrical secretory cells. It has also been shown that the secretions of these cells play a physiological role similar to that of the seminal vesicles and prostate in aiding the movements of the spermatozoids from the beginning of the vas deferens to the seminal

vesicles. If the tail of the epididymis is removed, even if the canal is reunited, the progress of the spermatozoids is probably prevented.

Since it is generally admitted that there can be no hope of the cure of azoöspermia, Frank prefers that we prevent its appearance as far as possible. If it is not possible by early treatment to avoid epididymitis, we should devote all our efforts to its relief as soon as it appears, that is, in the acute period. Finger says that the subjective signs of inflammation disappear very rapidly under applications of ice. The considerable firm infiltration, however, remain and offer great resistance to its resorption. Frank has treated with encouraging results all his cases for eight years with a high degree of heat. He employs a special apparatus fixed in the suspensory bandage for applying the heat, which is maintained by an electric current.

The Relation of Traumatism to Appendicitis.—GUINARD (*Arch. gén. de Chir.*, 1907, i, 341) presented before the Paris Surgical Society 4 cases in which a relation was shown between traumatism and appendicitis. In the first case, a young man, an attack of appendicitis occurred two months after he had been kicked by a horse in the right iliac fossa. Six months later he had a second, and on the third attack, at the end of two years, he was operated on. The inflamed appendix showed only ordinary lesions. There had been no signs of appendicitis before the accident. The second case was a boy, who was kicked by a mule in the abdomen, and three months later he had his first light attack of appendicitis. Four months later there was another attack. Operation was performed in the interval and showed ordinary lesions in the appendix. The third case was that of a young man, who fell on his right flank, with resulting pain in the right iliac fossa and swelling. Operation showed an enormous hematoma, in the middle of which was the appendix absolutely sound. The writer suggests that adhesions following a traumatism may kink or constrict the appendix, decreasing its resistance against infection. The fourth patient had a gangrenous appendix containing a blackish infected fluid. There was no preceding history of abdominal trouble. Four days before he had received a violent blow in the right iliac fossa. The pulse and temperature were normal and the general condition good. Guinard thinks that in this case, which is exceptional, the traumatism produced a contusion with crushing of the appendix and resulting gangrene.

Cancer Infection and Cancer Recurrence: A Danger to Avoid in Cancer Operations.—RYALL (*Lancet*, 1907, ii, 1311) believes that the usual cause of recurrence of cancer in the field of operation is not the result of inadequate operation, but of cancer infection of the wound at the time of the operation. There can be no reason to doubt that cancer cells liberated at the time of operation are capable of becoming implanted in the wound and developing into fresh malignant growths. Not enough importance is attached to this in the clinical teaching of the present time. The widespread dissemination of secondary cancer growths in the peritoneum is to be explained only by the fact that the cancer cell is highly infective and capable of implantation in circumstances which are perhaps particularly favorable to its growth in the abdomen. The cancer cells, becoming parted from the parent growth, are set free in the

peritoneal cavity and are carried about by the movements of peristalsis or even by the force of gravity, or perhaps their movements are aided by the ascitic fluid which is so frequently found in these cases. Where they become implanted they take on active growth and cause this widespread infection. There must also be a similar proneness for liberated cells to implant themselves in an operative wound.

THERAPEUTICS.

UNDER THE CHARGE OF

REYNOLD WEBB WILCOX, M.D., LL.D.,

PROFESSOR OF MEDICINE AND THERAPEUTICS IN THE NEW YORK POST-GRADUATE MEDICAL SCHOOL AND HOSPITAL; VISITING PHYSICIAN TO ST. MARK'S HOSPITAL,

ASSISTED BY

HENRY HUBBARD PELTON, A.M., M.D.,

INSTRUCTOR IN MEDICINE IN THE NEW YORK POST-GRADUATE MEDICAL SCHOOL AND HOSPITAL; CHIEF OF THE MEDICAL CLINIC, PRESBYTERIAN HOSPITAL DISPENSARY, NEW YORK.

The Treatment of Malaria in Children.—CRESPIN (*La province médicale*, 1907, 24, 303) advises the administration of quinine, by mouth if there is no gastric disturbance, hypodermatically in the presence of digestive symptoms. The taste of the drug may be disguised by giving it encased in sugar or chocolate, in albolene or one of the fixed oils; it may be followed by a little lemon juice. Solutions for hypodermatic administrations should be largely diluted, and it is better to employ several injections of small size than a single large one. A useful formula consists of 35 to 45 grains of quinine bichloride to 150 minims of water. To this 30 grains of antipyrine may be added to increase the solubility of the quinine salt and to lessen the pain of the injection. The maximum dose for a child under two years is 7½ minims; from two to five, 15 minims; from five to ten, 22 minims; from ten to fifteen, 30 minims. The tasteless quinine compounds, euquinine and aristochine, may be substituted for quinine for mouth administration. Certain adjuvants, notably arsenic, will materially increase the good effect of the quinine, and cryogenine is useful as an antipyretic in instances of hyperpyrexia, but has no influence on the infection. Laxatives are beneficial when the fever has disappeared and the digestion is sluggish and the liver and spleen are congested. In chronic malaria hydrotherapeutic measures may be employed, but douches over the splenic region may induce a malarial paroxysm. Splenic hypertrophy in children may be subjected to radiotherapy. In hemoglobinuria quinine should be given only in small doses and injections of artificial serum may be administered in order to supply mineral matter to the blood.

Renal Decapsulation in Eclampsia.—DE BOVIS (*La semaine médicale*, 1907, x, 109) has successfully treated a patient, in whom the ordinary forms of treatment had wholly failed, by decapsulation of the right

kidney. Previous to the operation the patient had suffered from repeated convulsions. After recovery from the anesthesia a considerable quantity of urine containing albumin was passed, but this manifestation disappeared completely within a few days. The particular point of interest is that this is the first instance of cure of eclampsia following the decapsulation of a single kidney.

The Treatment of Infantile Convulsions.—According to WEILL (*Journal de médecine de Paris*, 1907, xix, 26, 249), in addition to the usual means, chloroform inhalations, hot baths, ice-bags to the head, etc., we may employ, during the paroxysm, compression of the carotids, alternating between the right and the left if the convulsions are general; if they are unilateral the carotid of the opposite side should be subjected to the pressure, the compression being maintained for about four seconds at a time; the seizures should become less and less frequent as well as less intense after each compression. Leeches may be applied to the mastoid and malleolar regions. The injection of 1 to 2 ounces of artificial serum two or three times daily may be beneficial in eclamptic seizures with fever, dryness of the mucous membranes, dysuria, etc. In asphyxic spasms oxygen inhalations are advised and in laryngospasm rhythmical traction of the tongue and titillation of the pharynx may relieve the condition. In safeguarding the patient against recurrences our chief resources are hydrated chloral, the bromides, and antipyrine. The action of chloral is very rapid and the dosage for a newly born infant is $\frac{4}{1000}$ to $\frac{7}{1000}$ grain; for a nursling, from $\frac{7}{1000}$ to $\frac{1}{50}$ grain; such doses may be given three to five times daily; the rectal dose is double the above. The bromides may be given in doses of 15 to 45 grains per day. The child should be kept in as quiet a state as possible; proper feeding is very important and physical fatigue should be avoided.

Bismuth Subnitrate in Gastropathies.—HAYEM (*La quinzaine thérapeutique*, 1907, viii, 218) is an enthusiastic advocate of the use of bismuth subnitrate in stomach lesions. It is the agent of choice in ulcer, in which it hastens healing and lessens the pain and vomiting. In the pain of hyperchlorhydria the bismuth salt is far preferable to sodium bicarbonate, since the latter is not curative, but aggravates the disordered chemistry of the stomach which causes the pain. Likewise the bismuth relieves all forms of gastralgia when of organic origin, no matter what the chemical defect in the secretion of the organ may be. In ulcerating cancer it relieves the pain markedly, but unfortunately here the pain recurs when the medication is stopped. Not only is bismuth effective against pain, but it also relieves the sialorrhœa, emesis, and spasm of ulcer; it likewise relieves simple aërophagia, but is ineffective in the hysterical type of this affection. The best mode of administration is in doses of from 4 to 5 drams once daily. Small doses are less active and are more likely to cause constipation, though three doses a day of from 75 to 90 grains may be employed. When one dose daily is prescribed it should be taken ten to fifteen minutes before breakfast suspended in about a third of a glass of water. Administration of the bismuth, 5 drams in a half-pint of water, through the tube after lavage is advisable in some instances.

Morphine in Cardiac Dyspnœa.—HAY (*The Practitioner*, 1907, lxxix, 487) states that morphine is of recognized value in the treatment of cardiac dyspnœa, a fact easily recognized when one appreciates the fact that dyspnœa is largely subjective and that its severity bears no direct relation to the frequency of respiration or cardiac pulsation. Cardiac dyspnœa may be associated with two entirely different phases of arterial blood pressure, and in both of these morphine is useful. In patients with low pressure the trouble is primarily valvular. For these patients, when there is muscular failure, the morphine should be combined with digitalin or digitalin and atropine in order to tone the failing myocardium and at the same time to relieve the subjective sensations of dyspnœa. If the blood pressure is high, probably over 200 mm. of mercury, the morphine should be combined with a vasodilator, given by the mouth or hypodermatically. The drugs of the nitrite group and ammonium hippurate may be employed here.

Atropine in Acute Morphine Poisoning.—KOCH (*Klin.-thera. Woch.*, 1907, xiv, 737) has studied the action of these drugs upon men and animals and makes the following statements concerning them. In many instances of atropine poisoning enormous doses of morphine can be given, which shows at least that atropine is antagonistic to morphine. Reports of instances of mixed poisoning exist in which the morphine has been prevented from exerting its narcotic effect and its depressory action upon respiration. Numerous instances of morphine poisoning have been treated with belladonna and atropine and especially significant are those in which marked and rapid betterment has followed the hypodermatic administration of the latter. The instances in which atropine had no action or did harm may be explained upon the ground of improper administration of the antidote. In retrospect it would seem that atropine given in not too large doses, but still in sufficient quantity, is to be relied upon. The proper dosage would seem to be $\frac{1}{30}$ of a grain, given hypodermatically and repeated at intervals of sufficient length. The drug should be stopped as soon as the contracted pupil begins to dilate, this being the sign that the organism has received enough. In morphine intoxication atropine should not be our only resource, but other agents, such as caffeine, strychnine etc., and especially those which act upon the respiratory centre, should be employed.

Physostigmine Salicylate in the Prevention of Postoperative Intestinal Atony.—VINEBERG (*Surgery, Gynecology, and Obstetrics*, 1907, v, 184) considers that this drug is of some value in this connection; its use is free from danger and worthy an extended trial, and it would seem to be of especial value in counteracting the probable paralyzing effect upon the intestine of the morphine which most patients need during the first few hours after a laparotomy. Vineberg's patients received the physostigmine salicylate with the initial dose of morphine just as they were recovering from the effect of the anesthetic; 15 of the 37 patients observed experienced no need for an enema to relieve distention before the fourth day after operation, when they received a purgative; 1 patient expelled flatus in thirty hours; 4 patients needed an enema within twenty-four hours; to 3 an enema was given in thirty hours, to

3 in forty-two hours, to 7 in forty-eight hours, to 3 in seventy-two hours. Of 55 patients who received no physostigmine after operation the percentage of those who called for relief was much greater. The danger of the drug, in the author's opinion, is not so great as some observers believe; these consider that the peristalsis which it causes might, in the presence of small and unrecognized injuries to the intestine, be attended with serious results. Harm may also ensue when meteorism is already present, or when it is due to mechanical obstruction or peritonitis.

Antitoxin in Diphtheritic Paralyses.—PERRIN (*Revue médical de l'Est*, 1907, 11, 356) cites an instance of diphtheritic sensory and motor polyneuritis affecting all four limbs and raises the question as to whether this complication would have supervened if the patient had been subjected to systematic antitoxin treatment after the nervous manifestations had begun. He considers that in this patient rapid relief would have ensued if injections of antidiphtheritic serum had been given frequently —say, every two or three days. Such frequent injections as these, however, should not be practised without precautions, for repeated injections, especially if the doses are large, may induce untoward effects. The patient should be kept on a fluid diet, the channels of elimination should be kept freely open, and upon the least sign of untoward reaction the injections should be stopped. Haushalter is quoted as having observed a series of experiments which lead him to think that antitoxin treatment is of decided value in the prevention of diphtheritic paralysis.

Veronal in Seasickness.—SCHEPELMANN (*Therapeutische Monatshefte*, 1907, xxi, 406), after an experience with a number of patients, concludes that in veronal we have a useful means of preventing and relieving seasickness. As a prophylactic he prescribes the drug in doses of 7½ grains; in the height of the ailment he gives 30 grains daily, if necessary, in divided doses of from 10 to 15 grains each. Certain patients under this treatment feel no symptoms of seasickness and are able to eat with gusto and to go about the deck at will; others are relieved of headache and nausea, but continue to suffer from vertigo and lack of appetite; in a few subjects the treatment is unavailing. If severe emesis is present the veronal is given by rectum in double the oral dosage, the drug being soluble in 150 parts of hot water. It seldom exhibits any cumulative effect, and, the therapeutic dose being much less than the toxic dose, no symptoms of poisoning are likely to be observed.

PEDIATRICS.

UNDER THE CHARGE OF

LOUIS STARR, M.D., AND THOMPSON S. WESTCOTT, M.D.,
OF PHILADELPHIA.

Differential Diagnosis Between Measles and Rubella.—H. M. MCCLANAHAN (*Jour. Amer. Med. Assoc.*, 1907, xlix, 1916) thus sums up the differential diagnosis of measles and rubella. Measles always has a cough,

and it is usually characteristic; conjunctivitis is nearly always present; pharyngitis is always present and the soft palate is always implicated; the fever is intermittent; a strong light and careful inspection will always reveal Koplik's spots. The prodromal symptoms vary in degree; they precede the rash for from three to five days, and may send the patient to bed. The rash is maculopapular, and begins on the forehead and face; it spreads all over the body in forty-eight hours; the papules are at first discrete, then fuse, but always leave irregular patches of normal skin between them; the rash begins to fade on the third day; it takes longer to disappear than in rubella. The temperature varies with the amount of rash, and may rise to 104°. The prodromal symptoms of rubella are always slight; many patients do not have them at all, while in measles they are always present; there are no Koplik spots during the prodromal period ; the superficial lymphatic glands are usually enlarged and tender. The rash is papular, begins about the lips and cheeks and covers the whole body in twenty-four hours; the papules remain more discrete; the rash fades more quickly; by the third day it may have entirely disappeared; there is no pigmentation, as seen after measles. The fever rarely rises beyond 101°. The glandular enlargement precedes the eruption in rubella, follows it in measles. Measles may have complications, rubella has not.

Practical Importance of Sore Throat in Epidemic Cerebrospinal Meningitis.—WESTENHOEFFER (*Berl. klin. Woch.*, 1907, xliv, 1213) states that sore throat always precedes epidemic cerebrospinal meningitis. Meningococci are always to be found in the pharyngeal secretion of meningitis patients, even very early in the disease, and are also found in healthy individuals and such as are having simple pharyngitis. It is usually the part above the soft palate which is affected. The larger the adenoids the more likely the children are of being hosts to meningococci. Not all cases of meningitis, following sore throat, however, are due to the meningococcus. The disease is probably spread by adults, in whose throats the meningococcus exists as a saprophyte, expectorating and thus scattering the organism about broadcast. The author reports a case in which, after a hemorrhoid operation, which was performed with stovain spinal anesthesia, the young man developed a meningococcic meningitis, of which he died on the fourth day. The organisms were found in the cerebrospinal fluid, but nowhere else in the body; no possible opportunity for the infection could be discovered, even after examining all the persons present at the time of the operation. He also reports the case of a baby, who died on the third day of such a meningitis, and in whom the kidneys were found to be full of the organism. This case suggests the possibility of excreta other than the sputum acting as carriers of the contagium.

Diseases and Displacement of the Testicle in Childhood.—D'ARCY POWER (*Medical Press and Circular*, 1907, lxxxiv, 333) states that the diseases of the testicle in children group themselves under the headings of tubercle, syphilis, malignant growths, innocent tumors, and teratomas; displacements are due to faulty processes of development carrying with them additional predispositions to injury and disease. Tuberculous disease of the testicle is rare in children, but not as rare as the sta-

tistics indicate. It is sometimes primary, but more often secondary, and there is always a history of injury. It is a unilateral affection. The disease usually remains localized, the testicle being enlarged for some time, and then its size diminishes; atrophy is almost unknown. The treatment should be palliative, but a watchful eye should be kept on the body weight of the patient; if it falls, dissemination should be looked for, and the testicle removed at once if anything to support such a suspicion should exist. If suppuration results, removal is positively indicated.

Syphilis usually occurs before the age of three, is bilateral and almost always associated with hydrocele. Other signs of inherited syphilis are present. General enlargement of the testicle is more common than gummas, and suppuration is rare unless tuberculosis co-exists. Because of the painlessness and chronicity the process is usually overlooked, until late in the disease. Impotence and sterility are the necessary associates of this condition, if both testicles are affected.

Teratomas are either dermoids or sebaceous cysts; they should be removed without injury to the testicle if possible; if incorporated with the gland, this must be removed. Teratomas do not possess the translucency of hydroceles, and are more uniform in outline than epiploceles.

Sarcomas are rare in boys younger than ten; an injury frequently precedes. They grow very rapidly and because of their painlessness are usually very large before advice is sought. Immediate removal is the treatment, and even then most of the patients die. Imperfectly descended testicle, if associated with hernia, must be removed at once; if no hernia, it is better to wait until the patient is seven to eight years old, as sometimes the testicle descends further. Hydroceles should be punctured, and if they refill, a radical operation should be performed.

Symmetrical Gangrene Occurring in Patients with Malaria.—E. J. Wood (*Jour. Amer. Med. Assoc.*, 1907, xlix, 1891) reports 8 cases, in all of which there were symmetrical gangrenous lesions of the skin; 3 had malaria, as proved by the previous history, the quinine test, and the presence of the plasmodia; in the other 5 malaria was supposed to be present, since they all lived in a neighborhood where everyone has malaria, and no other provocative agent could be found. Six of the patients were children, and 2 of these died. Wood concludes that malaria may be considered a direct or a provocative agent of symmetrical gangrene of the skin. The skin lesions differed somewhat from the classical description of Raynaud. In one of his cases tertian and quartan malaria co-existed.

Sarcoma of the Eyelid in an Infant Seven Months Old.—H. S. Wieder (*New York Med. Jour.*, 1907, lxxxvi, 976) reports a case of sarcoma of the the eyelid in an infant seven months old; it was presumed to be a lipoma until after the pathological examination. Wieder says the tumor was probably a lipoma which had undergone sarcomatous degeneration. He calls attention to the rarity of sarcomas during the first year of life, he being able to find only about 20 cases recorded in literature. While the location of the eyelid is a relatively infrequent one for all ages, it is relatively frequent in cases under one year. Two weeks after removal of the tumor recurrence was noted; this was treated by Röntgen rays,

and had entirely disappeared after five months of treatment. Nine months have elapsed since the original operation, and the child has remained entirely well and free of signs of tumor formation.

Facial Hemiatrophy.—T. KLINGMANN (*Jour. Amer. Med. Assoc.*, 1907, xlix, 1888) has been able to collect 83 typical cases of facial hemiatrophy, and divides them into two classes: cases in which the atrophy is complete, without functional disturbance of the facial muscles, with little or no disturbance of cutaneous sensation, and no vasomotor symptoms; and cases which present, in addition to the clinical picture of the first division, vasomotor symptoms, flushing or paleness, temperature differences, and secretory disturbances. Of his cases, 57 belonged to the first, 26 to the second division; 66 per cent. of the patients were females, and 66 of the 83 patients were less than twenty years old. A number of the cases were preceded by infectious fevers, such as scarlet fever, typhoid fever, erysipelas, suppurative tonsillitis, suppurative otitis media, and other abscesses in the neighborhood of the ear. In the case reported by Klingmann there is a direct heredity of physical deviations occurring in successive generations, the grandmother, mother, and twin-sisters. One of the latter had a complete right-sided facial hemiatrophy, the other a noticeable asymmetry of face and ears. The patient, a girl of sixteen, had suffered from headache since her sixth year. The pain was severest over the right occiput, down the neck to the seventh cervical vertebra, down the right shoulder and arms; the pain radiated to the parietal and frontal regions of the same side. The facial atrophy began with a brown discoloration in the supra-orbital region of the right side about the seventh year; beneath it a depression could be felt in the bone. The hair of this side began to fall out and the facial muscles to emaciate; this has continued progressively ever since. Careful comparative measurements were made and are recorded in the original paper. The right eye was less prominent than the left. There was tenderness on pressure over all of the spinal nerves, particularly over the great occipital nerve. The skin of the face was discolored, its elasticity diminished; perspiration over the affected side was less than over the unaffected. All the signs in this and the sister's cases point to a developmental defect, a defective nutritive process. Considering the symptoms of all the cases collected, it is evident that the symptoms are those of disturbed trophic function, that the disorder is more or less acute and more rapidly progressive at the beginning of the disease, and that the association with acute conditions is a close one; traumatism is not infrequent and infections are occasionally met. In these points and in the close analogy of the symptoms with those occurring in neuritis there is evidence of a peripheral nerve lesion.

OBSTETRICS.

UNDER THE CHARGE OF
EDWARD P. DAVIS, A.M., M.D.,
PROFESSOR OF OBSTETRICS IN THE JEFFERSON MEDICAL COLLEGE, PHILADELPHIA.

The Relation of Streptococci to Thrombosis.—Von Bardeleben (*Archiv f. Gyn.*, 1907, lxxxiii, 1) contributes a paper giving the result of his investigations upon the influence that streptococci exert in producing thrombosis. Several factors contribute to the production of thrombosis by these organisms. First is the relation between the coccus and the leukocytes. The erythrocytes are sometimes involved in the process, but only in a passive way. They are influenced by streptococci; they are damaged by them without exerting influence in return upon the germs. With leukocytes the case is different; they show considerable resistance to the germs in proportion to the vitality of the individual cells. While they may be destroyed by the streptococci they are in return rapidly reproduced. Under certain conditions which are not pathological the relation between leukocytes and streptococci remains a fairly constant and normal one, and acute infection does not develop; the streptococci remain practically harmless. Were it not for the introduction of new germs or additional toxins from without, the leukocytes would speedily overcome the streptococci.

Another factor of importance is the resistance of the walls of the vessels to the passage of streptococci. When the vessels remain sound streptococci of feeble virulence cannot pass through them. The resisting power of this tissue seems to be greater than that of any other connective tissue. When, however, the walls of the veins cease to resist streptococci, the passage of the germs into the blood causes infection of the blood and thrombosis. Streptococcic thrombosis occurs only when the germs gain access to stagnant blood or when they make their exit through the walls of the vessels. While it is possible that streptococci may pass directly through the cavity of the uterus into the blood current, it is not probable. Only germs of the highest virulence can survive the resistance of the blood. Virulent streptococci find in the lymph channels and lymphatics a much more fruitful and convenient field, and general infection of the blood current through the uterine cavity must then be considered unusual.

Although streptococci may be in the cavity of the uterus the zone of resistance to infiltration may be built up by leukocytes from some other cause of irritation. The great channel, however, for the entrance of infection is partially collapsed or dilated veins. When such vessels remain open streptococci multiply along the walls of the vessels; and when they are closed by thrombi streptococci pass through these masses. If, however, the vessels are tightly closed a streptococcus finds the same resistance afforded by a resisting zone of leukocytes. It is then of the greatest importance, in preventing infection of the blood by streptococci, that the venous channels in the uterus should be completely closed.

To effect this the uterine muscle must contract efficiently, for when it does not the veins remain distended and the blood current passes through them much more slowly. The arrangement of the venous system of the uterus is such that the entrance of streptococci from the uterine cavity must almost invariably produce thrombosis.

The subsequent course of this condition will depend upon the virulence of the streptococcus or upon the ability of the germs present to increase in virulence through failure of the action of the leukocytes. If the streptococci are exceedingly virulent they will be hindered but a short time by the coagulation of the blood. Such coagulation tends to force bacteria through the walls of the vessels. When the bacteria are of feeble virulence they may produce no general symptoms. They gradually perish in the current of the blood. Where, however, the streptococci increase in virulence they form thrombi which grow against the blood stream. Poisons produced by germs give rise to general symptoms, œdema develops, and bacteria increase in virulence unless overcome by the resisting power of the leukocytes. Such a process usually terminates in the formation of pus if the resistance of the leukocytes is efficient. A typical illustration of this process is seen in phlegmasia alba dolens. The increased virulence of the streptococci is maintained by the accession of fresh poison, the thrombosis becomes purulent, and the affected individual perishes in about a week. Such is the course of a thrombotic pyemia.

Puerperal thrombosis with pyemia may be overcome by the closure of the central vessels, and in the typical uncomplicated form the streptococci are not of the highest virulence, grow within the vessels only, and have their exit through the vessels hindered by the resistance of the vessel wall. Further, the resisting zone of leukocytes tends to obstruct their progress.

Von Bardeleben does not think that the effort to control streptococcic thrombosis by ligation can be successful. When it is possible to diagnosticate this condition, a general infection has already occurred, the virulence of the streptococci is high, and the thrombosis is practically only a symptom of the general condition. When thrombosis has occurred the walls of the vessels are usually yielding to the passage of the streptococci.

It is in most cases almost impossible to distinguish clinically between cases in which the streptococci are undergoing resistance by leukocytes and those in which the walls of the vessels permit the passage of the germs.

Intraperitoneal Rupture of the Bladder during Labor.—PORTER (*Trans. Obstet. Soc. London*, 1907, p. 170) describes the case of a primipara, whom he saw in the first stage of labor. The pains were few in number, lasting but a short time, and in the back only. The position and presentation were normal, and there was no evidence of undue distention of the bladder. There was no indication of pelvic contraction, although it is not stated that the pelvis was measured. The first stage of labor was prolonged, efficient contractions developing very slowly. When labor finally began the pains continued during the night, increasing in severity. The following morning during a pain the patient suddenly complained that something had torn and began to suffer greatly from general abdominal pain.

When her physician arrived the knees and thighs were flexed upon the abdomen, the pulse 160, respirations rapid and shallow. The lips were dry, the tongue furred and dry in the centre. The abdomen was distended and tympanitic, especially at the epigastrium. The patient complained of general and continuous pains not resembling the pains of labor. The body of the child could be outlined and the uterus did not appear to be spasmodically contracted. The head was well engaged in the pelvis and the os uteri nearly dilated. The head could be pushed up, although this caused pain. The patient was at once delivered under chloroform with forceps. The cord pulsated very feebly and the child died soon after. The placenta and membranes were delivered about twenty minutes after, followed by severe postpartum hemorrhage. There was no severe laceration found after labor.

After delivery the patient's pains ceased and the abdomen was not sensitive to pressure. The pulse continued rapid and no urine was passed, but the patient was not catheterized. On the following day vomiting occurred without the passage of urine. The patient developed peritonitis with enormous distention and was removed to a hospital, where the abdomen was opened, and the sigmoid flexure, ascending and descending colon were found fully packed with hard feces. The stomach was enormously distended and gas was evacuated from it by a small trocar. The puncture was closed by sutures. Examination of the bladder showed a vertical rent about one-half inch in the upper and posterior portion. The bladder was closed and the abdominal cavity flushed with hot saline solution and a drainage tube was introduced, leading down to the bladder. The patient did not recover and an autopsy could not be obtained.

The Uterus Four Years After Cesarean Section.—BLAND-SUTTON (*Trans. Obstet. Soc. London*, 1907, p. 174) had the opportunity to examine a uterus four years after Cesarean section. The patient was operated upon at the London Hospital because she was pregnant and had a fibroid of the lower portion of the uterus which rendered the expulsion of the child impossible. She was delivered by Cesarean section. The tumor was not removed, as it was thought to be a fibrosarcoma springing from the pelvic wall.

Four years afterward the patient came under Sutton's care and he removed the tumor, which proved to be an ovarian fibroid. It was adherent to the uterus, which was spread out over the face of the tumor. The sutures used to close the uterus at the Cesarean section could be plainly seen on its anterior surface, resembling a series of transverse braids. The uterus was so adherent to the tumor that it could not be separated without hemorrhage and the body of the womb was removed with the tumor. A portion of the uterine wall was excised and examined microscopically, when it was found that the tissue surrounding the sutures seemed to be fibroid in character.

Sutton also reports another case in which he performed hysterectomy on a patient who had previously been delivered by Cesarean section. On examining the uterus it was found that the uterine wall had not united throughout its whole thickness. The suture material had been entirely absorbed.

In discussing the paper cases were reported in which silk sutures

had remained quiescent in the uterus for nearly seven years. The patient then became infected with syphilis, when an abscess formed around one of the stitches, a sinus resulting, which closed when the stitch was removed. Another case was reported in which silkworm-gut suture had been employed to close the uterus and this remained unchanged.

GYNECOLOGY.

UNDER THE CHARGE OF

J. WESLEY BOVÉE, M.D.,

PROFESSOR OF GYNECOLOGY IN THE GEORGE WASHINGTON UNIVERSITY, WASHINGTON, D. C.

Investigations Concerning Endometritis.—F. HITSCHMANN and L. ADLER (*Zeit. f. Geb. u. Gyn.*, 1907, lx, 63) have made an extensive study of endometritis and make the following summary of their study: Endometritis glandularis hypertrophica and endometritis glandularis hyperplastica have nothing whatsoever to do with inflammation. Endometritis glandularis hypertrophica is not even a pathological condition of the uterine mucosa, but corresponds to the premenstrual state of the normal lining of the uterus. Endometritis glandularis hyperplastica consists partly of normal premenstrual conditions, partly of variations in the number of glands within physiological limits; in addition, it includes cases in which there is a glandular hypertrophy of the uterine mucous membrane, but this also is a change which is entirely independent of inflammation. There is but one variety of inflammation of the uterine mucosa, endometritis interstitialis, or, as it is usually called, endometritis. The inflammatory process is found, just as in inflammations of other organs, in the stroma of the mucous membrane. This robs endometritis of its artificially produced differences and places it with other inflammations on the general pathological basis. The diagnosis of endometritis is made by demonstrating the cells of infiltration; these cells, spoken of as plasma cells, are characteristic both from a morphological and staining standpoint.

The Mechanism of Axial Rotation of the Pedicle in Tumors of the Ovary.—R. JOLLY (*Zeit. f. Geb. u. Gyn.*, 1907, lx, 87) reports from Olshausen's clinic the case of a woman of sixty-three who was to have been operated on for tumor of the ovary, but who died from cardiac weakness before the operation was started. The autopsy revealed a large avarian tumor twisted on its axis. Further study and reflection concerning the production of torsion of the pedicle led Jolly to the following series of statements: Every growing ovarian tumor has the tendency to fall toward the middle of the pelvis, as there it finds the least

resistance. A tumor growing toward the median line does not have to change its position in the pelvis to approach the centre. A tumor increasing in size sideward very soon cannot grow any more in that direction, as it comes in contact with the pelvic wall. It is then pushed toward a point of less resistance with a strength corresponding to its increase in volume. As the tumor is held fast at one pole, its change in position is only possible by twisting around this pole. As the axis is usually in the direction of the long diameter of the pelvis the twisting is usually around its vertical and not its transverse axis. The direction of the tumor's migration depends upon the position of the axis and the free pole of the tumor; if the tumor develops behind the uterus the axis lies anteriorly and the tumor turns backward on itself: it twists in the direction of supination (Kuestner); if the pedicle is at the back of the growing tumor the rotation will be forward, in pronation. The tumor continues to grow in the direction once entered upon; a half-turn brings the posterior surface anteriorly, and vice versa; the same is true of the pedicle. The force producing the twisting of the pedicle is found in the growth of the tumor; the direction of the torsion, in the type of development.

Prolapse of the Ovary and Its Treatment.—G. G. WARD (*Jour. Amer. Med. Assoc.*, 1907, xlix, 1507) discusses the clinical significance and the treatment of prolapse of the ovary. The treatment depends upon whether the prolapse is or is not accompanied by retrodisplacement of the uterus. Ward recognizes two degrees of prolapse: In the first the ovary rests upon the fovea retro-ovarica of Waldeyer (termed the retro-ovarian shelf by Polk), and in the second it rests entirely upon the bottom of Douglas' cul-de-sac. Goldspohn has said that in 95 per cent. of cases of prolapsed ovaries there is a retroverted uterus, and Hanks, that in 33 per cent. of all uterine displacements prolapse of the ovary is present. Probably owing to the differences in venous circulation of the two sides and the passage of feces down the sigmoid, the left ovary is the more frequently prolapsed; or, if both are prolapsed, the degree is greater on the left side. Ward believes that nothing less than surgical treatment avails. If uterine displacement be present and corrected, and the ovaries are in that manner returned to their normal positions, nothing more is needed. But he believes that in a considerable proportion of instances the infundibulopelvic and ovarian ligaments are relaxed and should be shortened. In the class of cases that have prolapse of the ovary independent of uterine displacement, or after such displacement has been relieved, he believes additional surgical treatment is advisable. For this he prefers Imlach's operation of oöphorrhaphy as modified by Hirst, Sanger, Mauclaire, or Barrows. Of the modifications mentioned, Ward is partial to Barrows', which consists of shortening the round and infundibulopelvic ligaments and drawing the ovary through a buttonhole made in the broad ligament above the round one. The ovary is then lightly fixed on the anterior side of the broad ligament. If Gilliam's operation of round ligament shortening is done, the buttonhole is made, as in Mauclaire's modification, below the round ligament. Ward supports his position by the report of 11 cases of operation for this condition.

Eversion of the Tube in Tubal Abortion.—E. FALK (*Zentrbl. f. Gynäk.*, 1907, xxxi, 1404) says a high degree of eversion of the fimbriated end of the Fallopian tube was observed in a case of ectopic pregnancy. The clinical symptoms pointed to tubal rupture rather than tubal abortion. The mucous membrane was found everted on the different sides from 1.7 to 3.7 cm. This observation is believed to support the view of Werth that the expulsion of the embryo in tubal abortion is due to the contraction of the musculature of the tube and not primarily to the pressure of the mass of blood back of the embryo, as believed by Martin.

Chondrosarcoma of the Cervix Uteri.—MICHEL and HOCHE (*Ann. de gyn. et d'obst.*, October, 1907, 607) report a case in a woman of thirty-five years, who had had three children, and who, after eighteen months of metrorrhagia and menorrhagia, consulted a physician, who removed what he considered was a polyp. Three months later severe hemorrhages, sudden and severe, occurred, and another examination revealed a mass of considerable size springing from the cervix. The mass was removed and the actual cautery applied. Two months later the symptoms led to another examination, and a friable, soft, bloody mass was found filling the vagina and attached to the cervix. It resembled a bunch of grapes. Some of the mass was hard and some soft. Hysterectomy was done. The growth appeared to have originated in margins of cicatrices of the cervix. From careful microscopic examination of the specimen and the case history, Michel and Hoche concluded that the disease had begun as a chronic inflammation of the cervical mucosa, which had given rise to a scirrhous inflammation and the production of a polypoid hyperplasia of the cervical mucosa. The new growth had developed along the borders of the cicatrix and had invaded all the coats of the uterus. Michel and Hoche claim that the grape-like form of the growth is characteristic of this form of sarcoma.

Hyperplastic Changes in the Mucous Membrane of the Uterus.—A. HARTJE (*Zentrbl. f. Gynäk.*, 1907, xxxi, 1465) objects to the use of the terms glandular and interstitial hyperplasia of the endometrium. The changes often described under these terms as pathological are considered by the author merely as normal premenstrual changes in the uterine glands and stroma cells. Hartje describes the changes in the glands before, during, and after menstruation, and calls particular attention to a form of gland which is considered as of some pathological significance.

Ovary and Tube and Ovarian Tumors in the Inguinal Canal.—J. H. CARSTENS (*Jour. Amer. Med. Assoc.*, 1907, xlix, 1512) refers to the paper of Andrews, based upon 88 cases of prolapse of the ovary or tube, or both, into the inguinal canal, and adds to that number 27 other cases that he had found in a very careful literary research, together with one that has occurred in his own work. He also reports a case of ovarian cyst weighing six pounds and lying in and outside the inguinal canal. This unique case is thought to be the first, as no similar case is to be found in medical literature.

OTOLOGY.

UNDER THE CHARGE OF

CLARENCE J. BLAKE, M.D.,

PROFESSOR OF OTOLOGY, HARVARD UNIVERSITY, BOSTON, MASSACHUSETTS.

The Treatment of Otitis Media by the Method of Induced Hyperemia of Bier.—F. ISEMER (*Arch. f. Ohrenheilk.*, 1907, lxix), under the incentive of Schwartze, subjected 12 cases of suppurative disease of the middle ear to treatment according to the method of Bier, and reported both his results and his conclusions. Of the 12 cases 9 were complicated with more or less extensive implication of the mastoid, 11 of the cases being acute and 1 chronic. The method of treatment was that followed in the clinic of Bonner according to the original technique of Bier, the means employed for compression being gum-elastic bands varying in width from 2 to 3 cm., the narrower being used in the cases of children; the degree of compression was regarded as sufficient when the face was of a bluish-red color, the compression being continued under these conditions from twenty to twenty-two hours daily. The summary of results is in accordance with the statements made by Schwartze: (1) The treatment of otitis media by this method is not without danger because of the possible delay in the application of otherwise indicated surgical measures for relief. (2) This method should be further tested clinically, in order to determine the forms of inflammatory processes in which an attempt at treatment by this method is applicable, and to determine also its duration before operative treatment is entered upon. (3) Protracted treatment by this method is especially hazardous in instances of diplococcic otitis. (4) The method is absolutely contra-indicated in the event of intracranial complication of the otitis.

The So-called Cyclic Course of Acute Otitis Media.—O. KOENER (*Zeit. f. Ohrenheilk.*, 1907, lxvi) cites 3 cases under his own observation on the basis of which he suggests control observations with reference to the statement of Zaufal that the course of true otitis media is typical and corresponds to the cyclic development of the pathogenic agent. When the parasite has reached the full point of its development, that is, when the medium is exhausted, there is a resolution of the inflammatory process, similar to that occurring in pneumonia, and characterized by a sudden critical diminution of temperature, this natural course being allowed to come to its conclusion without the intervention of paracentesis. Koener has never observed, in uncomplicated otitis media, the high temperature lasting several days and with the sudden diminution not infrequent in pneumonia, an observation in which he is supported by Heine, but also regards it probable that the peculiar pneumonic temperature curve, if observed in an otitis, is due not to the otitis, but to some such complication as the co-existent exostosis of a pneumonic focus; the observations of Preising also having shown

that pneumonia is a frequent complication in the otitis of childhood and an almost invariable complication in the otitis of nurselings, a statement based upon searching examination, since these pneumonias are easily overlooked on account of the small area involved and the absence of cough, expectoration, pain, and dyspnœa. With the assumption, based upon careful investigation that a high fever lasting several days and ending in rapid fall, in a case of otitis depends upon a simultaneous pneumonia, the theory of the cyclic course of acute otitis media is robbed of its foundation.

Professionally Induced Impairment of Hearing.—HABERMANN (*Arch. f. Ohrenheilk.*, 1907, lxix) reports 107 cases of impairment of hearing, putatively the result of exposure to continued loud noises—smiths, boiler-makers, metal-workers, millers, locomotive engineers, conductors, coopers, artillery men, and others whose loss of hearing resulted from disease of the perceptive portion of the organ of hearing. The pathological examinations included 10 specimens from 5 individuals; the changes in the internal ear, observable in all of them, was an atrophy of the organ of Corti confined in the majority of cases to the basal and vestibular portion of the cochlea extending, in 4 cases, only to the upper whorls and then in so much less a degree as to permit the supposition of its being attributable to other causes. Corresponding to the changes in the organ of Corti the nerve fibers in the lamina spiralis were either atrophied or had entirely disappeared—a condition which was in contrast to the contents of the ganglion cells of the canalis spiralis. The conclusion to be drawn from these observations was, that the effect of long-continued exposure to loud sounds evidenced itself primarily in the implication of the organ of Corti, and secondarily in the progressive atrophy of the tributary nerves.

Spontaneous Operation Induced by Cholesteatoma.—SUNE-MEDAN (*Revista Barcelonesa de oido; garganta*, etc., December, 1906) adds one more to the number of recently recorded cases of a form of spontaneous removal of the outer epitympanic wall observable in any extended practice, but none the less valuable for record as an indication for earlier operative interference along the same lines. The case reported is that of a woman twenty-eight years of age, who for two months had suffered from pain in the ear, an oscillating sensation and dizziness, and, within a month, swelling over the mastoid process and slight discharge from the ear. Examination showed marked prolapse of the posterior superior canal wall leaving only the lower portion of the drum head visible; postaurally there was that fluctuating swelling the incision of which liberated a quantity of fetid pus, the knife plunging without resistance into a large cavity. On the day following the incision a large mass of cholesteatomatous material was evacuated, leaving a large opening from which the posterior bony wall of the external auditory canal was entirely wanting, its removal having been as completely effected as it might have been by radical operation, and there was slight facial paralysis. Four days later the cavity was completely dry; at the end of twelve days it was almost completely epidermatized, and at the end of a month and a half completely closed in. The special interest attaching to the case lies in the unusually speedy destruction

of the posterior canal wall and the extension of the cholestatoma between the bone and periosteum, an exaggeration of the minor cases of cholesteatomatous destruction above mentioned. At the time of the report the patient was well, the perforation in the drum-head had closed, there was neither tinnitus, dizziness, nor facial paralysis, and the hearing was one-half of normal.

Disturbance of Equilibrium Resulting from Disease of the Semicircular Canals.—J. BOROWIKOV (*Wojenno Medizinski Schurnal*, St. Petersburg, May, 1907). The patient, a man aged twenty-four years, was admitted to the clinic for nervous diseases of the Petersburger Military Medical Academy after exposure to severe cold. The hearing in both ears was much impaired, his sight was dim, and he balanced himself with difficulty; a thorough examination gave no evidence of other disease than that within the cranium, and the hearing was reported to have decreased so much within the preceding year as to make the use of a conversation tube necessary. Both drum-heads were opaque, thick, and wanting in light reflex, but movable under the Siegle speculum. The particular interest in the case centred itself about the peculiarity of the disturbance of equilibration, which was equally in evidence whether the patient walked or stood still, and he could neither run nor walk backward, and could turn to one side or the other only with the greatest difficulty. (1) Examination by means of the centrifuge determined that the direction of movement was determined more easily when the movement was rapid than when it was slow. (2) The sensation of movement in the opposite direction occurred occasionally only when the movement was rapid and suddenly stopped. (3) There was no sensation of dizziness either in the centrifuge or without it. (4) Nystagmus was wanting. From all of which it was evident that the function of the labyrinth, and especially as concerned the semicircular canals, was very much decreased. Furthermore, no dizziness was excited by closing or opening an induction current of from five to six milliamperes.

PATHOLOGY AND BACTERIOLOGY.

UNDER THE CHARGE OF
WARFIELD T. LONGCOPE, M.D.,
DIRECTOR OF THE AYER CLINICAL LABORATORY, PENNSYLVANIA HOSPITAL,
ASSISTED BY
G. CANBY ROBINSON, M.D.,
RESIDENT PHYSICIAN, PENNSYLVANIA HOSPITAL, PHILADELPHIA.

The Pathological Anatomy, Etiology, and Epidemiology of Miliary Fever.—Epidemics of miliary fever have been reported by several observers, and A. WEICHSELBAUM (*Zeit. f. klin. Med.*, 1907, lxii, 21) has had an opportunity of investigating three epidemics. In one epidemic, which lasted from February until May, 57 persons were attacked, 24.5 per

cent. of whom died; in the second epidemic 34 persons were attacked, with a mortality of 32.3 per cent.; and in the third epidemic, lasting from March until July, 1905, 126 persons were affected, the mortality being 16 per cent. These epidemics showed that the locality and the season of the year were of little importance. The peculiarity of the epidemics, the characteristic clinical course of the disease, and the pathological anatomical findings all stamp the condition as a disease "sui generis." So long as there is no epidemic the disease may be mistaken for other conditions, and at times epidemics may be confounded with scarlet fever, measles, and rötheln. The sudaminæ, whether they occur as nodules or vesicles containing clear or milky fluid, are never caused by a retention of fluid in the sweat glands, but are always of an inflammatory nature. This could be shown by serial sections through sudaminæ. The lesions are found in the epidermis principally, though changes are also present in the corium. The disease does not seem to be contagious. Although many methods of investigation were resorted to, the cause of the disease could not be discovered.

The Effects of Resection of the Hypophysis.—PAULESCO (*Jour. de physiol. et de path. gén.*, 1907, ix, 441) has been able to devise a method by which he could remove portions of the hypophysis or the entire hypophysis in dogs and cats without serious injury to the surrounding structures. Complete removal of the hypophysis of dogs is followed very rapidly by death. The animals never survive the operation more than twenty-four hours. If the animal lives longer than twenty-four hours after the operation for complete removal, one may always find a small bit of the hypophysis which has been left behind. There are no special symptoms which are characteristic either after complete or incomplete removal. Excision of a portion of the cortical substance of the epithelial lobe does not give rise to any particular symptoms, and the dogs which have undergone this operation may live indefinitely. If, however, the entire cortical substance of the epithelial lobe is removed, the effect is the same as if the entire gland had been excised. On the other hand, ablation of the entire lobe which is composed of nerve elements, is not followed by symptoms and is compatible with life. During the experiments it was found that the third ventricle could be opened without fatal results. Death following excision of the hypophysis was not caused by injuries to the base of the brain, for such injuries were always followed by convulsions, hemispasms, and similar severe nervous disturbances. Paulesco concludes that the hypophysis is an organ which is indispensable to life. Its absence causes rapid death. Of the various parts of the gland the most important is the cortical portion of the epithelial lobe.

Trypanosome Infection through the Mucous Membrane of the Gastro-intestinal Tract.—Although it has been demonstrated, almost without a doubt, that tryponosomes are conveyed from infected animals to their new host by the means of insects, still a number of observations which have been published suggest that there may be still other methods of transmission. YAKIMOFF and SCHILLER noticed, two years ago, that a gray rat which had fed upon the body of a white rate infected with trypanosome developed trypanosomiasis. They therefore studied this

method for the transmission of the disease (*Cent. f. Bact. und Parasit.*, 1907, xliii, 694) and have found that it is possible, in a certain number of instances, to produce the disease by feeding rabbits, dogs, guinea-pigs, and rats with meat infected with trypanosomes. Mice could not be infected by this means. The possibility of infection through mechanical abrasion of the mucous membrane was excluded. With the first experiments artificial means were resorted to for the purpose of furthering the infection. The animals were starved, opium was given, and an attempt was made to neutralize the gastric juice with sodium bicarbonate. With the exception of opium, which slowed the peristalsis, these measures were not found to increase perceptibly the tendency to infection through the gastro-intestinal tract. This path of infection does not, of course, have much importance in the transmission of the disease to herbivorous animals or to man, but it may play a certain role in the transmission of the disease to the carnivora.

The Action of Tobacco Smoke upon the Bloodvessels of Rabbits.—It has long been suspected by clinicians that tobacco had some effect upon the heart's action, while certain observers have even attributed some importance to tobacco in the etiology of arteriosclerosis. To throw some light upon this question from the experimental side ZEBROWSKI (*Cent. f. Allg. Path. und Path. Anat.*, 1907, xviii, 337) has inoculated rabbits with nicotine and the soluble products of tobacco smoke. Rabbits were inoculated intravenously repeatedly and at short intervals with an extract of "Machorka" smoke (Machorka is a low grade of tobacco which is smoked generally by the peasants in Russia)—an extract of a better grade of tobacco, a 0.5 per cent. solution of nicotine, and for control purposes adrenalin solution. At the time that the author wrote his paper 11 of the 40 inoculated rabbits had died; 4 rabbits which had received the "Machorka" smoke extract all showed more or less marked changes in the aorta. The changes consisted in dilatation of the vessel with irregular nodular thickening of the intima. 3 of the 5 rabbits which had received nicotine showed the same type of lesions in the aorta, while 1 of 2 adrenalin rabbits showed changes in the aorta. The aortas of 6 control rabbits kept under the same conditions were, of course, normal. Though this is but a preliminary report Zebrowski considers that he has sufficient proof to show that the soluble substances of tobacco smoke are capable, when injected into rabbits, of giving rise to definite changes in the walls of the bloodvessels.

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All communications should be addressed to—

Dr. A. O. J. KELLY, 1911 Pine Street, Philadelphia, U. S. A.